WEST Search History

Hide Items | Restore | Clear | Cancel

DATE: Friday, December 09, 2005

Hide?	Set Name	Query	Hit Count
		DB=USPT; PLUR=YES; OP=OR	
☐	L1	6667158.pn.	1
		DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=OR	
☐	L2	(h-1 or h1 or Hn or h-n or N-terminal or ntermainal).ti,ab,clm.	30541
☐	L3	L2 and (botulinum or botulism or botulin or botox or dysport or clostridia or clostridial or clostridium)	309
☐	L4	L2 and (botulinum or botulism or botulin or botox or dysport or clostridia or clostridial or clostridium).ti,ab,clm.	68
☐	L5	L4 and (peptide or epitope or mapping or mapped or map or polypeptide or antigenic or monoclonal or hybridoma or mab or moab or antibodies or antibody or scfv or humanized).ti,ab,clm.	51

END OF SEARCH HISTORY

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YSTEM:OS  - DIALOG OneSearch
  File 155:MEDLINE(R) 1951-2005/Nov 15
         (c) format only 2005 Dialog
*File 155: Completed records will cease to update on 16 November. Please
see HELP NEWS 154 for details.
  File   5:Biosis Previews(R) 1969-2005/Nov W2
         (c) 2005 BIOSIS
  File  73:EMBASE 1974-2005/Nov 21
         (c) 2005 Elsevier Science B.V.
  File 156:ToxFile 1965-2005/Nov W2
         (c) format only 2005 Dialog
  File 654:US Pat.Full. 1976-2005/Nov 17
         (c) Format only 2005 Dialog
  File 440:Current Contents Search(R) 1990-2005/Nov 21
         (c) 2005 Inst for Sci Info
  File 349:PCT FULLTEXT 1979-2005/UB=20051117,UT=20051110
         (c) 2005 WIPO/Univentio
  File 144:Pascal 1973-2005/Nov W2
         (c) 2005 INIST/CNRS
  File 358:Current BioTech Abs 1983-2005/Oct
         (c) 2005 DECHEMA
  File 185:Zoological Record Online(R) 1978-2005/Nov
         (c) 2005 BIOSIS
  File 453:Drugs of the Future 1990-2005/OCT
         (c) 2005 Prous Science
*File 453: Chemical structure searching (CSS) now enabled in this
file. And the file is updating regularly. See HELP NEWS 453.
  File 342:Derwent Patents Citation Indx 1978-05/200573
         (c) 2005 Thomson Derwent
  File 203:AGRIS 1974-2005/Aug
         Dist by NAL, Intl Copr. All rights reserved
  File  35:Dissertation Abs Online 1861-2005/Oct
         (c) 2005 ProQuest Info&Learning
  File  98:General Sci Abs/Full-Text 1984-2004/Dec
         (c) 2005 The HW Wilson Co.
  File 340:CLAIMS(R)/US Patent 1950-05/Nov 17
         (c) 2005 IFI/CLAIMS(R)
*File 340: The 2005 reload is online as of October 17, 2005.   See
HELP NEWS 340 for details.
  File 143:Biol. & Agric. Index 1983-2005/Sep
         (c) 2005 The HW Wilson Co
  File 621:Gale Group New Prod.Annou.(R) 1985-2005/Nov 21
         (c) 2005 The Gale Group
  File 348:EUROPEAN PATENTS 1978-2005/Nov W01
         (c) 2005 European Patent Office
  File  94:JICST-EPlus 1985-2005/Sep W3
         (c)2005 Japan Science and Tech Corp(JST)
  File  50:CAB Abstracts 1972-2005/Oct
         (c) 2005 CAB International
  File  10:AGRICOLA 70-2005/Nov
         (c) format only 2005 Dialog
  File  16:Gale Group PROMT(R) 1990-2005/Nov 21
         (c) 2005 The Gale Group

      Set  Items  Description
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Cost is in DialUnits
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Terminal set to DLINK
? t s3/9/16 18 19 24 27 28 30 49
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erwent Accession: 2004-440365
Antibodies against type a botulinum neurotoxin
Inventor: Bavari, Sina, INV
Melendez, Edna R., INV
Lebeda, Frank, INV
Correspondence Address: ATTN: MCMR-JA (Elizabeth Arwine- PATENT ATTY) U. S. Army Medical Research and Materiel Command, Staff Judge Advocate Office 504 Scott Street, Fort Detrick, MD, 21702-5012, US

	Publication Number	Kind	Date	Application Number	Filing Date
Main Patent	US 20040110284	A1	20040610	US 2003655450	20030904
Division	US 6667158			US 99465276	19991216
Provisional				US 60-112632	19981217

Fulltext Word Count: 12791

Abstract:
Antibodies for binding epitopes of **BoNT** /A and **hybridomas** which produce such antibodies are described. The antibodies of the present invention can be used in a method for detecting **BoNT** /A in a sample and/or in a method for purifying **BoNT** /A from an impure solution. In addition, the antibodies can be used for passive immunization against **BoNT** /A intoxication or as intoxication therapy. Another aspect of the invention is a kit for...

Summary of the Invention:
[0001] Anaerobic bacterium **Clostridium** botulinum produces seven immunologically distinct but structurally similar botulinum neurotoxins (BoNTs) designated BoNT/A-G...

...0002] Following synthesis, highly active neurotoxin generated by proteolytic cleavage of the CNTs (**clostridial**

Exemplary or Independent Claim(s):

...4. A continuous **hybridoma** cell line having deposit accession number ATCC PTA-971, and clones thereof, which cell line produces **monoclonal** antibody to **BoNT** /A...

...5. A continuous **hybridoma** cell line having deposit accession number ATCC PTA-969, and clones thereof, which cell line produces **monoclonal** antibody to **BoNT** /A...

...6. A continuous **hybridoma** cell line having deposit accession number ATCC PTA-970, and clones thereof, which cell line produces **monoclonal** antibody to **BoNT** /A...

...7. A **monoclonal** antibody which binds an epitope comprising amino acids 1150-1289 of **BoNT** /A...

...8. A **monoclonal** antibody which binds an epitope comprising amino acids 1157-1181 of **BoNT** /A...

...9. A **monoclonal** antibody which binds an epitope comprising amino acids 1230-1253 of **BoNT** /A...

...10. A **monoclonal** antibody which binds an epitope comprising 1157-1253 of **BoNT** /A...

...14. A method for detecting **BoNT** /A said method comprising: (i) incubating a sample with an effective amount of at least one **monoclonal** antibody against **BoNT** /A, under conditions which allow the formation of an antibody- **BoNT** /A complex; and (ii) detecting the antibody- **BoNT** /A complex whe

Antibodies against type a botulinum neurotoxin
; CONTACTING A SAMPLE WITH THE MONOCLONAL ANTIBODY 6B2-2 PRODUCED BY ATCC PTA-969 HYBRIDOMA AND ISOLATING THE IMMUNOLOGICAL COMPLEX FORMED BETWEEN THE BONT /A IN THE SAMPLE AND THE MONOCLONAL ANTIBODY.

Inventor: Bavari, Sina, Frederick, MD
Torres Melendez, Edna R., Frederick, MD
Lebeda, Frank J., Phurmont, MD
Assignee: The United States of America as represented by the Secretary of the Army(06), Washington, DC
U S of America Army Secretary of (Code: 86528)
Examiner: Smith, Lynette R. F. (Art Unit: 165)
Assistant Examiner: Zeman, Robert A.
Combined Principal Attorneys: Arwine, Elizabeth; Harris, Charles H.

	Publication Number	Kind	Date	Application Number	Filing Date
Main Patent	US 6667158	A	20031223	US 99465276	19991216

Fulltext Word Count: 10418

Abstract:
Antibodies for binding epitopes of **BoNT** /A and **hybridomas** which produce such antibodies are described. The antibodies of the present invention can be used in a method for detecting **BoNT** /A in a sample and/or in a method for purifying **BoNT** /A from an impure solution. In addition, the antibodies can be used for passive immunization against **BoNT** /A intoxication or as intoxication therapy. Another aspect of the invention is a kit for...

11838458 PMID: 9097417

Epitope regions in the heavy chain of Clostridium botulinum type E neurotoxin recognized by monoclonal antibodies.

Kubota T; Watanabe T; Yokosawa N; Tsuzuki K; Indoh T; Moriishi K; Sanda K ; Maki Y; Inoue K; Fujii N

Department of Microbiology, Sapporo Medical University, Japan.

Applied and environmental microbiology (UNITED STATES) Apr 1997, 63 (4) p1214-8, ISSN 0099-2240 Journal Code: 7605801

Publishing Model Print

Document type: Journal Article

Languages: ENGLISH

Main Citation Owner: NLM

Record type: MEDLINE; Completed

Subfile: INDEX MEDICUS

Seventeen **monoclonal** antibodies (MAbs) were previously established against the heavy chain (Hc) of **botulinum** type E neurotoxin in BALB/c mice immunized with the type E toxoid. Five MAbs (LE15-5, LE34-6, EK19-7, EK21-4, and AE27-9) showed toxin-neutralizing activity in mice. Two of the five MAbs, EK19-7 and EK21-4, recognized the regions located at amino acid positions 731 to 787 and 811 to 897, respectively. One of the remaining three antibodies (LE34-6) reacted with the amino acid sequence VIKAIN, at amino acid positions 663 to 668, closed by the ion channel-forming domain. It is suggested that the ion channel-forming domain may also be associated with the blocking of acetylcholine release. Furthermore, the amino acid sequence YLTHMRD within 30 residues of the C-terminal region of the Hc component seemed to be recognized by LE15-5. It has been reported that the binding domain of the type E toxin is located on the C-terminal half of the Hc component. Therefore, the neutralizing activity of LE15-5 antibody may be attributed to its ability to block the binding of neurotoxin to the receptor of target cells.

Descriptors: *Botulinum Toxins--immunology--IM; * **Clostridium** botulinum --immunology--IM; *Epitopes--genetics--GE; Amino Acid Sequence; Animals; Antibodies, Bacterial--immunology--IM; Antibodies, **Monoclonal** --immunology --IM; **Botulinum** Toxins--genetics--GE; **Clostridium botulinum** --genetics --GE; Epitope Mapping; Epitopes--immunology--IM; Mice; Mice, Inbred BALB C; Molecular Sequence Data

CAS Registry No.: 0 (Antibodies, Bacterial); 0 (Antibodies, Monoclonal); 0 (Botulinum Toxins); 0 (Epitopes); 0 (botulinum toxin type E)

Record Date Created: 19970709

Record Date Completed: 19970709

3/9/19 (Item 19 from file: 155)

DIALOG(R)File 155:MEDLINE(R)

11792031 PMID: 9041392

Sensitive assay for measurement of antibodies to Clostridium botulinum neurotoxins A, B, and E: use of hapten-labeled-antibody elution to isolate specific complexes.

Doellgast G J; Brown J E; Koufman J A; Hatheway C L

Department of Biochemistry, Bowman Gray School of Medicine, Winston-Salem, North Carolina 27157-1016, USA. gdoellga@bgsm.edu

Journal of clinical microbiology (UNITED STATES) Mar 1997, 35 (3) p578-83, ISSN 0095-1137 Journal Code: 7505564

Publishing Model Print

Document type: Journal Article

Languages: ENGLISH

07810 Endospore-forming Gram-Positives

3/9/78 (Item 11 from file: 5)
DIALOG(R)File 5:Biosis Previews(R)

0007962779 BIOSIS NO.: 199242065670
PROPERTIES OF MONOCLONAL **ANTIBODIES AGAINST** CLOSTRIDIUM - BOTULINUM **TYPE A NEUROTOXIN**
AUTHOR: FINCH S G (Reprint); HALLIS B; SHONE C C
AUTHOR ADDRESS: DIV BIOLOGICS, CENTRE APPLIED MICROBIOL RES, PORTON DOWN, SALISBURY, WILTS SP4 0JG, UK**UK
JOURNAL: Journal of Applied Bacteriology 71 (6): pXXI 1991
CONFERENCE/MEETING: ANNUAL GENERAL MEETING AND 60TH ANNIVERSARY SUMMER CONFERENCE OF THE SOCIETY FOR APPLIED BACTERIOLOGY, BRISTOL, ENGLAND, UK, JULY 15-19, 1991. J APPL BACTERIOL.
ISSN: 0021-8847
DOCUMENT TYPE: Meeting
RECORD TYPE: Citation
LANGUAGE: ENGLISH
DESCRIPTORS: ABSTRACT PROTEINS ANTIGENIC SITES NERVE BINDING
DESCRIPTORS:
MAJOR CONCEPTS: Biochemistry and Molecular Biophysics; Immune System--Chemical Coordination and Homeostasis; Infection; Nervous System--Neural Coordination; Toxicology
BIOSYSTEMATIC NAMES: Endospore-forming Gram-Positives--Eubacteria, Bacteria, Microorganisms
COMMON TAXONOMIC TERMS: Bacteria; Eubacteria; Microorganisms
CONCEPT CODES:
00520 General biology - Symposia, transactions and proceedings
10010 Comparative biochemistry
10054 Biochemistry methods - Proteins, peptides and amino acids
10064 Biochemistry studies - Proteins, peptides and amino acids
10068 Biochemistry studies - Carbohydrates
10506 Biophysics - Molecular properties and macromolecules
15002 Blood - Blood and lymph studies
17506 Muscle - Pathology
20504 Nervous system - Physiology and biochemistry
20506 Nervous system - Pathology
22501 Toxicology - General and methods
34504 Immunology - Bacterial, viral and fungal
36002 Medical and clinical microbiology - Bacteriology
BIOSYSTEMATIC CODES:
07810 Endospore-forming Gram-Positives

3/9/83 (Item 16 from file: 5)
DIALOG(R)File 5:Biosis Previews(R)

0006475898 BIOSIS NO.: 198937053647
MONOCLONAL **ANTIBODIES AGAINST HEAVY AND LIGHT CHAINS OF** CLOSTRIDIUM - BOTULINUM **TYPE A NEUROTOXIN**
AUTHOR: EVENSON M L (Reprint); TEPP W H; DASGUPTA B R
AUTHOR ADDRESS: UNIV WIS, MADISON, WIS, USA**USA
JOURNAL: Abstracts of the Annual Meeting of the American Society for Microbiology 89 p64 1989
CONFERENCE/MEETING: 89TH ANNUAL MEETING OF THE AMERICAN SOCIETY FOR MICROBIOLOGY, NEW ORLEANS, LOUISIANA, USA, MAY 14-18, 1989. ABSTR ANNU MEET AM SOC MICROBIOL.

ISSN: 0094-8519
DOCUMENT TYPE: Meeting
RECORD TYPE: Citation
LANGUAGE: ENGLISH
DESCRIPTORS: ABSTRACT
DESCRIPTORS:
  MAJOR CONCEPTS: Biochemistry and Molecular Biophysics; Immune System--Chemical Coordination and Homeostasis; Infection; Toxicology
  BIOSYSTEMATIC NAMES: Endospore-forming Gram-Positives--Eubacteria, Bacteria, Microorganisms
  COMMON TAXONOMIC TERMS: Bacteria; Eubacteria; Microorganisms
CONCEPT CODES:
  00520 General biology - Symposia, transactions and proceedings
  10064 Biochemistry studies - Proteins, peptides and amino acids
  22501 Toxicology - General and methods
  31000 Physiology and biochemistry of bacteria
  34502 Immunology - General and methods
  34504 Immunology - Bacterial, viral and fungal
  36002 Medical and clinical microbiology - Bacteriology
BIOSYSTEMATIC CODES:
  07810 Endospore-forming Gram-Positives

3/9/94 (Item 5 from file: 73)
DIALOG(R)File 73:EMBASE

05648216 EMBASE No: 1994050477
Antagonism of the intracellular action of botulinum neurotoxin type A with monoclonal antibodies that map to light-chain epitopes
Di Bello I.C.; Poulain B.; Shone C.C.; Tauc L.; Dolly J.O.
Department of Biochemistry, Imperial Sci., Technology/Med. Coll., South Kensington,London SW7 2AY United Kingdom
European Journal of Biochemistry (EUR. J. BIOCHEM.) (Germany) 1994, 219/1-2 (161-169)
CODEN: EJBCA ISSN: 0014-2956
DOCUMENT TYPE: Journal; Article
LANGUAGE: ENGLISH SUMMARY LANGUAGE: ENGLISH

mAbs were produced in mice against highly purified, renatured light chain (LC) of botulinum neurotoxin A (BoNT A) that was immobilised on nitrocellulose to avoid the undesirable use of toxoids. Subcutaneous implants of relatively high amounts (up to 10 mug each) of LC allowed its slow release into the systemic circulation and, thus, yielded much higher antibody titres against the underivatized antigen than had hitherto been obtained by conventional immunization. Seven stable **hybridoma** cell lines were established which secrete **mAb** of IgGinf 1 and IgG(2b) subclasses reactive specifically with **BoNT** A and LC, in native and denatured states, without showing any cross- reactivity with types B, E, F or tetanus toxin. The pronounced reactivities of three mAbs towards refolded LC or intact toxin, observed in immunobinding and precipitation assays, relative to that seen in Western blots imply a preference for conformational epitopes. Though mAbs 4, 5 and 7 failed to neutralize the lethality of **BoNT** in vivo, administration intraneurally of mAb7 prevented the inhibition of transmitter release normally induced by subsequent extracellular administration of **BoNT** A. Notably, the latter **mAb** reacted with a synthetic peptide corresponding to amino acids 28-53 in the N- terminus of the LC, a highly conserved region in **Clostridial** neurotoxins reported to be essential for maintaining the tertiary structure of the chain. Most importantly, when mAbs 4 or 7 were microinjected inside ganglionic neurons

Main Citation Owner: NLM
Record type: MEDLINE; Completed
Subfile: INDEX MEDICUS

The measurement of chicken and human antibodies to **Clostridium** botulinum neurotoxins A, B, and E was accomplished by affinity isolation of complexes containing these antibodies. By this approach, a mixture of toxin with the test antibody, fluoresceinated antibody, and enzyme (Russell's viper venom factor X activator)-labeled antibody is allowed to form a complex in solution phase. This complex is then bound to a matrix containing antifluorescein antibody. All components not bound to the matrix are washed off, and the complex is isolated intact by elution with fluorescein, which competes with the complex for binding to the antifluorescein matrix. The eluted complex is then bound to a matrix which specifically binds the test antibody (anti-chicken immunoglobulin Y [IgY] or anti-human IgG), and the bound complex is measured by using the enzyme label. Using this approach, we were able to measure as little as 1 ng of specific antibody per ml from affinity-isolated, monospecific chicken antibody preparations and to measure antibody specifically from IgY fractions of monospecific chicken antibody preparations. Human antibodies from subjects immunized with pentavalent toxoid preparations were detectable at dilutions as great as 24,300-fold, and undiluted serum from most control subjects showed no measurable antibody. Antibody was also measured in 65 subjects who were receiving preparations of neurotoxin A (BOTOX) for the treatment of spastic disorders. Eighteen of them had toxin-specific antibody reactive with toxin B, and two of them had toxin-specific antibody reactive with toxin A. The two patients having antibody to toxin A were refractory to treatment with this toxin. This approach of isolation of hapten-labeled immune complexes under nondenaturing conditions with hapten is broadly applicable to the specific measurement of antibodies present at very low concentrations in serum.

Tags: Research Support, U.S. Gov't, Non-P.H.S.

Descriptors: *Antibodies, Bacterial--analysis--AN; *Bacteriological Techniques; *Botulinum Toxins--immunology--IM; *Immunoassay--methods--MT; Animals; Antibodies, Bacterial--blood--BL; Antibodies, **Monoclonal** ; Antigen-Antibody Complex--isolation and purification--IP; Bacteriological Techniques--statistics and numerical data--SN; **Botulinum** Toxin Type A --administration and dosage--AD; **Botulinum** Toxin Type A--immunology--IM; Chickens; Evaluation Studies; Fluorescein; Fluoresceins; Haptens; Humans; Immunization; Immunoassay--statistics and numerical data--SN; Sensitivity and Specificity

CAS Registry No.: 0 (Antibodies, Bacterial); 0 (Antibodies, Monoclonal); 0 (Antigen-Antibody Complex); 0 (Botulinum Toxin Type A); 0 (Botulinum Toxins); 0 (Fluoresceins); 0 (Haptens); 0 (botulinum toxin type B); 0 (botulinum toxin type E); 2321-07-5 (Fluorescein)

Record Date Created: 19970602
Record Date Completed: 19970602

3/9/24 (Item 24 from file: 155)
DIALOG(R)File 155:MEDLINE(R)

11262225 PMID: 8577267

Immunological characterization of the neurotoxin produced by Clostridium **botulinum type A** associated with infant botulism in Japan.

Kozaki S; Nakaue S; Kamata Y

Department of Veterinary Science, College of Agriculture, University of Osaka Prefecture, Japan.

Microbiology and immunology (JAPAN) 1995, 39 (10) p767-74, ISSN 0385-5600 Journal Code: 7703966

Publishing Model Print

Document type: Journal Article
Languages: ENGLISH
Main Citation Owner: NLM
Record type: MEDLINE; Completed
Subfile: INDEX MEDICUS

The neurotoxin associated with type A infant botulism in Japan shows different antigenic properties from those produced by authentic strains. The monoclonal antibodies recognizing the light chain reacted to both neurotoxins, whereas half the antibodies recognizing the heavy chain reacted specifically to the respective neurotoxin. Each neurotoxin showed its own manner of binding to brain synaptosomes. These results indicate that the distinguishable characteristics are ascribable to the heavy chain but not to the light chain. In both neurotoxins, an epitope recognized by the monoclonal antibody that reacts to the light chain and neutralizes the toxin was found to be very close to the amino-terminal half (H-1 fragment) of the heavy chain. This may support the hypothesis that the H-1 fragment functions in the transport of the light chain in the target cell.

Descriptors: *Botulinum Toxins--chemistry--CH; *Botulism--microbiology --MI; * **Clostridium** botulinum--chemistry--CH; *Neurotoxins--chemistry--CH ; Amino Acid Sequence; Antibodies, **Monoclonal** --chemistry--CH; Antigens, Bacterial--immunology--IM; **Botulinum** Toxins--biosynthesis--BI; **Clostridium botulinum** --classification--CL; **Clostridium botulinum** --metabolism --ME; Endopeptidases; Epitopes--immunology--IM; Humans; Hydrolysis; Infant; Japan; Molecular Sequence Data; Neurotoxins--biosynthesis--BI; Protein Binding; Synaptosomes--chemistry--CH

CAS Registry No.: 0 (Antibodies, Monoclonal); 0 (Antigens, Bacterial) ; 0 (Botulinum Toxins); 0 (Epitopes); 0 (Neurotoxins)
Enzyme No.: EC 3.4.- (Endopeptidases)
Record Date Created: 19960314
Record Date Completed: 19960314

3/9/27 (Item 27 from file: 155)
DIALOG(R)File 155:MEDLINE(R)

10978053 PMID: 7756853

Production of monoclonal antibodies specific to Clostridium botulinum type B neurotoxin.

Noah C W; Poteet S S; Ramos N C; Perez J C; Huang S Y
U.S. Food and Drug Administration, Dallas, TX 75204, USA.

Journal of AOAC International (UNITED STATES) Mar-Apr 1995, 78 (2) p381-5, ISSN 1060-3271 Journal Code: 9215446
Publishing Model Print
Document type: Journal Article
Languages: ENGLISH
Main Citation Owner: NLM
Record type: MEDLINE; Completed
Subfile: INDEX MEDICUS

Four **monoclonal** antibodies were produced for use in a rapid method to detect **Clostridium botulinum** type B neurotoxin. Cells of mouse myeloma cell line SP2/0 were fused with splenocytes of immunized BALB/c mice. An immunoblot assay of semipurified commercial neurotoxins of C. **botulinum** types A, B, C, D, E, and F was used to show specificity. All the **monoclonal** antibodies reacted with type B neurotoxin but did not cross-react with the other types. The **monoclonal** antibodies, separately and combined, did not neutralize the toxin in mice, and all showed specificity to the whole neurotoxin molecule and the heavy-chain component by immunoblot. No evidence of specific binding to the hemagglutinin molecule was noted. When tested against concentrated cultured supernatants

of C. **botulinum** types A, B, E, and F, the 4 **monoclonal** antibodies reacted only against type B strains. They will be incorporated into a rapid assay with other specific **monoclonal** antibodies to detect C. **botulinum** neurotoxins from pure cultures or suspect foods.

Tags: Male

Descriptors: *Antibodies, **Monoclonal** --biosynthesis--BI; * **Botulinum** Toxins--immunology--IM; *Immunoglobulin G--biosynthesis--BI; Animals; Antibodies, **Monoclonal** --immunology--IM; Antibody Specificity; **Botulinum** Toxins--analysis--AN; Enzyme-Linked Immunosorbent Assay; **Hybridomas** ; Immunoglobulin G--immunology--IM; Mice; Mice, Inbred BALB C

CAS Registry No.: 0 (Antibodies, Monoclonal); 0 (Botulinum Toxins); 0 (Immunoglobulin G)

Record Date Created: 19950626

Record Date Completed: 19950626

3/9/28 (Item 28 from file: 155)

DIALOG(R)File 155:MEDLINE(R)

10932355 PMID: 7714333

Immunological detection of Clostridium **botulinum toxin type A in therapeutic preparations.**

Ekong T A; McLellan K; Sesardic D

Division of Bacteriology, National Institute for Biological Standards and Control, South Mimms, Hertfordshire.

Journal of immunological methods (NETHERLANDS) Mar 27 1995, 180 (2) p181-91, ISSN 0022-1759 Journal Code: 1305440

Publishing Model Print

Document type: Journal Article

Languages: ENGLISH

Main Citation Owner: NLM

Record type: MEDLINE; Completed

Subfile: INDEX MEDICUS

The potent neurotoxins produced by strains of **Clostridium** botulinum act by blocking the release of acetylcholine from peripheral nerve junctions. This specific action of the botulinum neurotoxins is now being exploited therapeutically to treat a variety of conditions involving involuntary muscle spasms. We aimed to develop a sensitive and specific enzyme-linked immunosorbent assay (ELISA) which may be used in parallel with the currently accepted mouse bioassay test for the determination of **botulinum** neurotoxin type A in therapeutic preparations. High titre polyclonal antitoxins and their biotin derivatives, highly labelled horseradish peroxidase (HRP)-antibody conjugates, and streptavidin-biotin-HRP complexes were prepared and used in a sandwich ELISA for the detection of pure neurotoxin and neurotoxin in therapeutic material. The ELISA utilized either a **monoclonal** or polyclonal antibody as capture agent and HRP-labelled IgG or F(ab')2 fragment as second antibody. The limit of detection was 4-8 pg of purified toxin/ml (gcv < 13%), equivalent to 1-2 mouse bioassay units/ml. The assay was used to evaluate therapeutic preparations and the results compared with the mouse bioassay. The lower limit of detection for a therapeutic preparation of BoTxA was 2-5 mouse bioassay units/ml. Although across different manufacturers and bulk products there was no correlation between immunologically detected neurotoxin and its biological activity in different therapeutic preparations ($r = -0.44$, $p = 0.34$, $n = 8$), the assay could be used to quantify neurotoxin in therapeutic preparations derived from the same bulk concentrate and manufacturer. The assay is relatively simple, and may be readily adapted to routine monitoring of BoTxA content in therapeutic preparations.

ORGANISMS: endospore-forming gram-positive rods and cocci (Endospore-forming Gram-Positives); **Clostridium** botulinum (Endospore-forming Gram-Positives); Balb/C mouse (Muridae
COMMON TAXONOMIC TERMS: Bacteria; Eubacteria; Microorganisms; Animals; Chordates; Mammals; Nonhuman Vertebrates; Nonhuman Mammals; Rodents; Vertebrates
MISCELLANEOUS TERMS: BACTERIAL DISEASE; BOTULINUM TOXIN; BOTULISM; ENZYME IMMUNOASSAY; IMMUNOLOGIC METHOD; INFECTION; MONOCLONAL ANTIBODY; NEUROTOXIN; TOXICITY; TOXICOLOGY; TOXIGENIC COLONIES
CONCEPT CODES:
20501 Nervous system - General and methods
22501 Toxicology - General and methods
34502 Immunology - General and methods
36001 Medical and clinical microbiology - General and methods
BIOSYSTEMATIC CODES:
07810 Endospore-forming Gram-Positives
86375 Muridae

3/9/77 (Item 10 from file: 5)
DIALOG(R)File 5:Biosis Previews(R)

0008131076 BIOSIS NO.: 199243099667
MONOCLONAL **ANTIBODIES TO** BOTULINUM **TOXIN PRODUCED BY RECOMBINANT TECHNOLOGY**
AUTHOR: MIDDLEBROOK J L (Reprint); LEATHERMAN D L; SMITH T; CROWELL J
AUTHOR ADDRESS: DEP TOXINOL, PATHOPHYSIOL DIV, US ARMY MED RES INST INFECT DIS, FREDERICK, MD 21702, USA**USA
JOURNAL: Toxicon 30 (5-6): p535 1992
CONFERENCE/MEETING: TENTH WORLD CONGRESS ON ANIMAL, PLANT AND MICROBIAL TOXINS, SINGAPORE, SINGAPORE, NOVEMBER 3-8, 1991. TOXICON.
ISSN: 0041-0101
DOCUMENT TYPE: Meeting
RECORD TYPE: Citation
LANGUAGE: ENGLISH
DESCRIPTORS: ABSTRACT **CLOSTRIDIUM** -BOTULINUM ESCHERICHIA-COLI VACCINE NEUROTOXIN
DESCRIPTORS:
MAJOR CONCEPTS: Immune System--Chemical Coordination and Homeostasis; Infection; Nervous System--Neural Coordination; Pharmacology; Physiology; Toxicology
BIOSYSTEMATIC NAMES: Enterobacteriaceae--Facultatively Anaerobic Gram-Negative Rods, Eubacteria, Bacteria, Microorganisms; Endospore-forming Gram-Positives--Eubacteria, Bacteria, Microorganisms
COMMON TAXONOMIC TERMS: Bacteria; Eubacteria; Microorganisms
CONCEPT CODES:
00520 General biology - Symposia, transactions and proceedings
10060 Biochemistry studies - General
10064 Biochemistry studies - Proteins, peptides and amino acids
10068 Biochemistry studies - Carbohydrates
20506 Nervous system - Pathology
22018 Pharmacology - Immunological processes and allergy
22501 Toxicology - General and methods
22505 Toxicology - Antidotes and prevention
31000 Physiology and biochemistry of bacteria
34502 Immunology - General and methods
34504 Immunology - Bacterial, viral and fungal
36002 Medical and clinical microbiology - Bacteriology
BIOSYSTEMATIC CODES:
06702 Enterobacteriaceae

against immobilized **botulinum** toxin subtype B allowed for the isolation of multiple high affinity Fab producing cell lines. These clones can be directed to express large quantities of Fab antibody at a significantly lower cost than **hybridoma** cell culture. Purification can be simplified by engineering an affinity tag directly into the nucleotide sequence of each antibody clone. Methods of construction and analysis are presented along with affinity constant determination and nucleotide sequencing data. Final rept. Feb 95-Jan 97. Perpared in cooperation with GEO-Centers, Inc., Rockville, MD.

Identifiers: Antibodies; Bacterial toxins; **Clostridium** botulinum

Record Date Created: 199712

3/9/104 (Item 5 from file: 156)

DIALOG(R)File 156:ToxFile

826679 NLM Doc No: NTIS/AD-A223-009/2 Sec. Source ID: NTIS/AD-A223 009/2

Preparation and Characterization of Mouse and Human Monoclonal **Antibodies to** Botulinum **Toxins.**

Hunter KW; Fisher GW; Hemming VG

Uniformed Services Univ. of the Health Sciences, Bethesda, MD. Dept. of Pediatrics.

Source: Govt Reports Announcements & Index (GRA&I), Issue 20, 1990

Pub. Year: 1983

Order Information: NTIS/AD-A223 009/2, 17p

NTIS Prices: PC A03/MF A01

Languages: UNSPECIFIED

Record type: Completed

Subfile: NTIS

TD3: The goal during this year of the project was to begin preparing and characterizing mouse and human **monoclonal** antibodies to **botulinum** toxoids. The initial step was to refine enzyme immunoassays for identifying both mouse and human **monoclonal** antibodies in **hybridoma** culture supernatants. Progress in this area has been good, though minor technical problems remain to be solved. Optimization of these assays was accomplished with hyperimmune mouse and human antisera obtained from Dr. Martin Crumrine, USAMRIID. Keywords: Mice, Human **monoclonal** antibodies, Enzyme immunoassays, Type B toxoids, Type E toxoids, Toxic, Microbiology, Medical research, **Botulinum** toxins. (jg) Progress rept.

Identifiers: Bacterial toxins; **Clostridium botulinum ; Monoclonal** antibodies; **Botulinum** toxin

Record Date Created: 199011

3/9/105 (Item 6 from file: 156)

DIALOG(R)File 156:ToxFile

785431 NLM Doc No: NTIS/03390028 Sec. Source ID: NTIS/ADA382808

Human Monoclonal **Antibodies for Neutralization of** Botulinum **Neurotoxin.**

Marks JD

California Univ., San Francisco.

Source: /u0103

Pub. Year: 2000

Order Information: 28p Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at

orders@ntis.fedworld.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
NTIS Prices: PC A03/MF A01
Languages: UNSPECIFIED
Record type: Completed
Subfile: NTIS
Final rept. 1 May 1998-30 Apr 2000. The purpose of this work is to generate neutralizing human **monoclonal** antibodies to **Botulinum** neurotoxins (**BoNT**) A, B, and E. To generate a large panel of antibodies, mice transgenic for the human immunoglobulin were immunized with **BoNT** /A, B, and E binding domain (Hc). RNA was prepared, the human variable regions amplified by PCR and used to construct human single chain Fv (scFv) antibody fragment gene repertoires. The repertories were cloned to create phage antibody libraries. Selection of the libraries on **BoNT** /A, B, and E Hc resulted in the isolation of a large panel of human **monoclonal** scFv antibody fragments. To demonstrate in vivo toxin neutralization, it was necessary to express the SCFv as fusions with the human IgG1 Fc region from the yeast Pichia pastoris due to the rapid serum clearance of scFv. ScFv-Fc fusions showed increased serum half life compared to scFv, but had a significantly shorter half life than IgG. Previously isolated murine and human scFv showed toxin neutralization in vivo as Fc fusions, with a combination of two neutralizing scFv-Fc fusions able to neutralize 100 toxin LD50s. Since the serum half life of the Fc fusions was significantly shorter than IgG's, the immunglobulin VH and VL genes of neutralizing scFv were sublconed into a mammalian vector for expression as human IgG (in the case of human scFv) or mouse-human chimeric IgG (in the case of murine scFv). To date, three IgG have been constructed from the three neutralizing scFv and stable cell lines are being constructed. Concurrently, human IgG are being constructed from scFv derived from transgenic mice immunized with BoNT/A, B, and E Hc. Our plan is to purify IgG from each clone and evaluate in vivo neutralization potency for each unique antibody and for combinations of antibodies. In this way, we anticipate identifying panels of antibodies capable of neutralizing BoNT/A, B, and E.
Identifiers: **Monoclonal** antibodies; *Toxins and antitoxins; *Bacterial toxins; * **Clostridium botulinum** ; Mice; Laboratory animals; Stability; Humans; Isolation; Yeasts; Genes; Clones; Blood serum; In vivo analysis; Cells(Biology); Immunoglobulins; Reproduction(Physiology); Half life; Neurotoxins; Bacteriophages; Transcription(Genetics); Phage display; Recombinant antibodies
Record Date Created: 200105

3/9/179 (Item 4 from file: 440)
DIALOG(R)File 440:Current Contents Search(R)

10907476 References: 52
TITLE: Sequence homology and structural analysis of the clostridial neurotoxins
AUTHOR(S): Lacy DB; Stevens RC (REPRINT)
AUTHOR(S) E-MAIL: stevens@scripps.edu
CORPORATE SOURCE: Scripps Clin & Res Inst, Dept Mol Biol, 10550 N Torrey Pines Rd/La Jolla//CA/92037 (REPRINT); Scripps Clin & Res Inst, Dept Mol Biol, /La Jolla//CA/92037; Univ Calif Berkeley, Dept Chem, /Berkeley//CA/94720
PUBLICATION TYPE: JOURNAL
PUBLICATION: JOURNAL OF MOLECULAR BIOLOGY, 1999, V291, N5 (SEP 3), P 1091-1104
GENUINE ARTICLE#: 233UP
PUBLISHER: ACADEMIC PRESS LTD, 24-28 OVAL RD, LONDON NW1 7DX, ENGLAND

ISSN: 0022-2836
CURRENT CONTENTS JOURNAL ANNOUNCEMENT: CC LIFE, V42, N40
LANGUAGE: English DOCUMENT TYPE: ARTICLE
GEOGRAPHIC LOCATION: USA
SUBFILE: CC LIFE--Current Contents/Life Sciences
JOURNAL SUBJECT CATEGORY: MOLECULAR BIOLOGY & GENETICS;
ABSTRACT: The **clostridial** neurotoxins (CNTs), comprised of tetanus neurotoxin (TeNT) and the seven serotypes of botulinum neurotoxin (BoNT A-G), specifically bind to neuronal cells and disrupt neurotransmitter release by cleaving proteins involved in synaptic vesicle membrane fusion. Ln this study, multiple CNT sequences were analyzed within the context of the 1277 residue BoNT/A crystal structure to gain insight into the events of binding, pore formation, translocation, and catalysis that are required for toxicity. A comparison of the TeNT-binding domain structure to that of BoNT/A reveals striking differences in their surface properties. Further, the solvent accessibility of a key tryptophan in the C terminus of the BoNT/A-binding domain refines the location of the ganglioside-binding site. Data collected from a single frozen crystal of BoNT/A are included in this study, revealing slight differences in the binding domain orientation as well as density for a previously unobserved translocation domain loop. This loop and the conservation of charged residues with structural proximity to putative pore-forming sequences lend insight into the CNT mechanism of pore formation and translocation. The sequence analysis of the catalytic domain revealed an area near the active-site likely to account for specificity differences between the CNTs. It revealed also a tertiary structure, highly conserved in primary sequence, which seems critical to catalysis but is 30 Angstrom from the active-site zinc ion. This observation, along with an analysis of the 54 residue "belt" from the translocation domain are discussed with respect to the mechanism of catalysis. (C) 1999 Academic Press.
DESCRIPTORS--Author Keywords: **clostridial** neurotoxin ; botulinum neurotoxin ; tetanus neurotoxin ; translocation ; X-ray crystallography
IDENTIFIERS--KeyWord Plus: TOXIN TYPE-A; I-125-LABELED **BOTULINUM** NEUROTOXINS; NERVE-TERMINALS; TETANUS TOXIN; HEAVY-CHAIN; SEROTYPE-A; NEUROTRANSMITTER RELEASE; **MONOCLONAL** -ANTIBODIES; PATTERN-RECOGNITION; CRYSTAL-STRUCTURE

3/9/238 (Item 2 from file: 50)
DIALOG(R)File 50:CAB Abstracts

0006270768 CAB Accession Number: 19901451034
Amplification systems in ELISA: use of NAD recycling system in the immunoassay of Clostridium **botulinum toxins types A and B in food.**
Modi, N. K.; Shone, C. C.; Hambleton, P.; Melling, J.
Porton International Ltd., 29 Chesham Place, London SW1X 8HB, UK.
Immunoassays for veterinary and food analysis - 1.
p.325-332
Publication Year: 1988
Editors: Morris, B.A.; Clifford, M.N.; Jackman, R.
Publisher: Elsevier Applied Science Publishers Ltd. Barking, Essex, UK
ISBN: 1-85166-138-7
Language: English Record Type: Abstract
Document Type: Miscellaneous
Amplified enzyme-linked immunosorbent assays (ELISA) for **botulinum** neurotoxin types A and B using a commercially available NAD recycling system, the ability of these ELISA to detect toxins in food extracts, and the specificity of various **monoclonal** antibodies used in these assays

Record Date Completed: 19940418

3/9/49 (Item 49 from file: 155)
DIALOG(R)File 155:MEDLINE(R)

08689355 PMID: 2668181 Record Identifier: 89339704

Immunological characterization of papain-induced fragments of Clostridium botulinum type A neurotoxin and interaction of the fragments with brain synaptosomes.

Kozaki S; Miki A; Kamata Y; Ogasawara J; Sakaguchi G
Department of Veterinary Science, College of Agriculture, University of Osaka Prefecture, Japan.

Infection and immunity (UNITED STATES) Sep 1989, 57 (9) p2634-9, ISSN 0019-9567 Journal Code: 0246127
Publishing Model Print
Document type: Journal Article
Languages: ENGLISH
Main Citation Owner: NLM
Other Citation Owner: NASA
Record type: MEDLINE; Completed
Subfile: INDEX MEDICUS

After treatment of **Clostridium botulinum** type A neurotoxin with papain, three fragments (Mrs, 101,000, 45,000, and 43,000) were purified by hydrophobic and ion-exchange chromatography with a high-performance liquid chromatographic system. Immunoblotting analyses with **monoclonal** antibodies showed that the 101,000-dalton fragment consisted of the light chain and a part of the heavy chain (H-1 fragment) linked together by a disulfide bond, and the other two fragments were correlated to the remaining portion of the heavy chain (H-2 fragment). The 45,000- and 43,000-dalton fragments effectively competed for binding of the 125I-labeled neurotoxin to synaptosomes, while no inhibition was observed with the 101,000-dalton fragment. The results indicate that the H-2 fragment interacts with the binding site on the neural membrane. The binding of the neurotoxin was impaired by treatment of synaptosomes with neuraminidase. Incorporation of gangliosides into neuraminidase-treated synaptosomes resulted in the restoration of binding. The results suggest that gangliosides are one of the components of the toxin-binding site.

Tags: Research Support, Non-U.S. Gov't
Descriptors: *Botulinum Toxins--immunology--IM; *Brain--metabolism--ME; *Clostridium botulinum--immunology--IM; *Neurotoxins--immunology--IM; *Papain--pharmacology--PD; *Synaptosomes--metabolism--ME; Animals; Antibodies, **Monoclonal** ; Antigens, Bacterial--immunology--IM; Binding Sites, Antibody; Binding, Competitive; **Botulinum** Toxins--metabolism--ME; **Botulinum** Toxins--pharmacology--PD; Immunoblotting; Mice; Mice, Inbred BALB C; Molecular Weight; Neurotoxins--metabolism--ME; Neurotoxins --pharmacology--PD
CAS Registry No.: 0 (Antibodies, Monoclonal); 0 (Antigens, Bacterial) ; 0 (Binding Sites, Antibody); 0 (Botulinum Toxins); 0 (Neurotoxins)
Enzyme No.: EC 3.4.22.2 (Papain)
Record Date Created: 19890915
Record Date Completed: 19890915

?

21nov05 14:23:38 User228206 Session D2539.4
$0.35 0.103 DialUnits File155
$1.76 8 Type(s) in Format 9
$1.76 8 Types
$2.11 Estimated cost File155

UniProtKB/Swiss-Prot entry P04958

Note: most headings are clickable, even if they don't appear as links. They link to the user manual or other documents.

Entry information

Entry name	**TETX_CLOTE**
Primary accession number	**P04958**
Secondary accession numbers	None
Entered in Swiss-Prot in	Release 05, August 1987
Sequence was last modified in	Release 05, August 1987
Annotations were last modified in	Release 49, January 2006

Name and origin of the protein

Protein name	**Tetanus toxin [Precursor]**
Synonyms	**EC 3.4.24.68** **Tentoxylysin**
Contains	**Tetanus toxin light chain** (Tetanus toxin chain L) **Tetanus toxin heavy chain** (Tetanus toxin chain H)
Gene name	**Name: tetX** OrderedLocusNames: ctp60
From	Clostridium tetani [TaxID: 1513]
Encoded on	Plasmid pE88; Plasmid 75 Kbp.
Taxonomy	Bacteria; Firmicutes; Clostridia; Clostridiales; Clostridiace Clostridium.

References

[1] NUCLEOTIDE SEQUENCE [GENOMIC DNA].
PLASMID=75 Kbp;
PubMed=3536478 [NCBI, ExPASy, EBI, Israel, Japan]
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"Tetanus toxin: primary structure, expression in E. coli, and homology with botulinum toxir
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[2] NUCLEOTIDE SEQUENCE [GENOMIC DNA].
PLASMID=75 Kbp;
STRAIN=CN3911;
PubMed=3774547 [NCBI, ExPASy, EBI, Israel, Japan]

Fairweather N.F., Lyness V.A.;
"The complete nucleotide sequence of tetanus toxin.";
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PLASMID=pE88;
STRAIN=Massachusetts / E88;
DOI=10.1073/pnas.0335853100; PubMed=12552129 [NCBI, ExPASy, EBI, Israel, Japan]
Brueggemann H., Baeumer S., Fricke W.F., Wiezer A., Liesegang H., Decker I., Herzberg
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[4] NUCLEOTIDE SEQUENCE [GENOMIC DNA] OF 742-1314.
PLASMID=75 Kbp;
PubMed=3510187 [NCBI, ExPASy, EBI, Israel, Japan]
Fairweather N.F., Lyness V.A., Pickard D.J., Allen G., Thomson R.O.;
"Cloning, nucleotide sequencing, and expression of tetanus toxin fragment C in Escherich
coli.";
J. Bacteriol. 165:21-27(1986).

[5] PARTIAL PROTEIN SEQUENCE, AND DISULFIDE BONDS.
PubMed=2108021 [NCBI, ExPASy, EBI, Israel, Japan]
Krieglstein K., Henschen A., Weller U., Habermann E.;
"Arrangement of disulfide bridges and positions of sulfhydryl groups in tetanus toxin.";
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[6] PARTIAL PROTEIN SEQUENCE.
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Krieglstein K.G., Henschen A.H., Weller U., Habermann E.;
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"Tetanus toxin is a zinc protein and its inhibition of neurotransmitter release and protease
activity depend on zinc.";
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[8] IDENTIFICATION OF SUBSTRATE.
DOI=10.1038/359832a0; PubMed=1331807 [NCBI, ExPASy, EBI, Israel, Japan]
Schiavo G., Benfenati F., Poulain B., Rossetto O., de Laureto P.P., Dasgupta B.R.,
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"Tetanus and botulinum-B neurotoxins block neurotransmitter release by proteolytic cleav
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Nature 359:832-835(1992).

[9] X-RAY CRYSTALLOGRAPHY (2.7 ANGSTROMS) OF 874-1314.
PubMed=9334741 [NCBI, ExPASy, EBI, Israel, Japan]
Umland T.C., Wingert L.M., Swaminathan S., Furey W.F. Jr., Schmidt J.J., Sax M.;
"Structure of the receptor binding fragment HC of tetanus neurotoxin.";
Nat. Struct. Biol. 4:788-792(1997).

Comments

- ***FUNCTION***: Tetanus toxin acts by inhibiting neurotransmitter release. It binds to periph neuronal synapses, is internalized and moves by retrograde transport up the axon into t spinal cord where it can move between postsynaptic and presynaptic neurons. It inhibit neurotransmitter release by acting as a zinc endopeptidase that catalyzes the hydrolysi the 76-Gln-|-Phe-77 bond of synaptobrevin-2.
- ***CATALYTIC ACTIVITY***: Hydrolysis of 76-Gln-|-Phe-77 bond in synaptobrevin 2.
- ***COFACTOR***: Binds 1 zinc ion per subunit *(By similarity)*.
- ***SUBUNIT***: The precursor polypeptide is subsequently cleaved to yield subchains L and These remain linked by a disulfide bridge and are non-toxic after separation.
- ***MISCELLANEOUS***: The C-terminus of the heavy chain binds to ganglioside receptors.
- ***SIMILARITY***: Belongs to the peptidase M27 family [view classification].

Copyright

Cross-references

EMBL	X04436; CAA28033.1; -; Genomic_DNA.	[EMBL / GenBank / DDBJ] [CoDingSequence]
	X06214; CAA29564.1; -; Genomic_DNA.	[EMBL / GenBank / DDBJ] [CoDingSequence]
	AF528097; AAO37454.1; -; Genomic_DNA.	[EMBL / GenBank / DDBJ] [CoDingSequence]
	M12739; AAA23282.1; -; Genomic_DNA.	[EMBL / GenBank / DDBJ] [CoDingSequence]
PIR	A25689; BTCLTN.	
PDB	1A8D; X-ray; @=864-1314.	[ExPASy / RCSB / EBI]
	1AF9; X-ray; @=864-1314.	[ExPASy / RCSB / EBI]
	1D0H; X-ray; A=871-1314.	[ExPASy / RCSB / EBI]
	1DFQ; X-ray; A=871-1314.	[ExPASy / RCSB / EBI]
	1DIW; X-ray; A=874-1314.	[ExPASy / RCSB / EBI]
	1DLL; X-ray; A=874-1314.	[ExPASy / RCSB / EBI]
	1FV2; X-ray; A=-.	[ExPASy / RCSB / EBI]
	1FV3; X-ray; A/B=864-1314.	[ExPASy / RCSB / EBI]
	1YVG; X-ray; A=1-457.	[ExPASy / RCSB / EBI]
	1YXW; X-ray; A=874-1314.	[ExPASy / RCSB / EBI]
	1YYN; X-ray; A=874-1314.	[ExPASy / RCSB / EBI]
	1Z7H; X-ray; A=1-442.	[ExPASy / RCSB / EBI]
	Detailed list of linked structures.	
MEROPS	M27.001; -.	
LinkHub	P04958; -.	
CMR	P04958; ctp60.	
InterPro	IPR011591; Botulinum.	
	IPR006025; Pept_M_Zn_BS.	
	IPR000395; Peptidase_M27.	
	IPR012928; Toxin_recpt_bd_N.	
	IPR012500; Toxin_trans.	
	Graphical view of domain structure.	

Pfam	PF01742; Peptidase_M27; 1. PF07953; Toxin_R_bind_N; 1. PF07952; Toxin_trans; 1. Pfam graphical view of domain structure.
PRINTS	PR00760; BONTOXILYSIN.
ProDom	PD001963; Botulinum; 1. [Domain structure / List of seq. sharing at least 1 domain]
PROSITE	PS00142; ZINC_PROTEASE; 1.
HOGENOM	[Family / Alignment / Tree]
BLOCKS	P04958.
ProtoNet	P04958.
ProtoMap	P04958.
PRESAGE	P04958.
DIP	P04958.
ModBase	P04958.
SWISS-2DPAGE	Get region on 2D PAGE.
UniRef	View cluster of proteins with at least 50% / 90% / 100% identity.

Keywords

3D-structure; Complete proteome; Direct protein sequencing; Hydrolase; Metal-bindin Metalloprotease; Neurotoxin; Plasmid; Protease; Toxin; Zinc.

Features

 Feature table viewer

 Feature aligner

Key	From	To	Length	Description	FTId
INIT_MET	0	0			
CHAIN	1	456	456	Tetanus toxin light chain.	PRO_00000
CHAIN	457	1314	858	Tetanus toxin heavy chain.	PRO_00000
ACT_SITE	233	233		*By similarity.*	
METAL	232	232		Zinc (catalytic) *(By similarity).*	
METAL	236	236		Zinc (catalytic) *(By similarity).*	
DISULFID	438	466		Interchain (between light and heavy chains).	
DISULFID	1076	1092			
STRAND	867	867	1		
STRAND	871	871	1		
STRAND	874	874	1		
HELIX	876	882	7		
TURN	883	883	1		
STRAND	884	891	8		
TURN	892	893	2		
STRAND	894	897	4		
STRAND	899	901	3		
STRAND	904	907	4		

TURN	909	910	2
STRAND	912	915	4
STRAND	917	927	11
TURN	928	929	2
STRAND	932	935	4
HELIX	938	940	3
TURN	941	946	6
STRAND	947	947	1
STRAND	949	956	8
HELIX	962	968	7
TURN	969	970	2
STRAND	972	977	6
STRAND	980	981	2
HELIX	983	985	3
STRAND	987	995	9
TURN	996	997	2
STRAND	998	1004	7
TURN	1006	1007	2
STRAND	1008	1008	1
STRAND	1010	1016	7
STRAND	1019	1020	2
TURN	1021	1022	2
STRAND	1023	1023	1
STRAND	1025	1029	5
STRAND	1031	1037	7
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STRAND	1041	1047	7
TURN	1048	1049	2
STRAND	1050	1056	7
TURN	1058	1059	2
STRAND	1067	1075	9
TURN	1079	1080	2
STRAND	1082	1093	12
HELIX	1097	1105	9
TURN	1106	1107	2
STRAND	1110	1112	3
STRAND	1114	1114	1
TURN	1116	1117	2
STRAND	1118	1120	3
STRAND	1122	1122	1
TURN	1123	1124	2
STRAND	1127	1131	5
HELIX	1132	1134	3
TURN	1135	1136	2
STRAND	1137	1143	7
TURN	1144	1145	2

STRAND	1146	1146	1
STRAND	1148	1152	5
STRAND	1155	1158	4
TURN	1159	1162	4
STRAND	1163	1166	4
STRAND	1169	1169	1
STRAND	1171	1171	1
STRAND	1173	1180	8
TURN	1184	1185	2
STRAND	1188	1188	1
STRAND	1190	1190	1
TURN	1191	1192	2
STRAND	1193	1201	9
TURN	1202	1203	2
STRAND	1204	1211	8
TURN	1212	1213	2
STRAND	1216	1217	2
TURN	1218	1220	3
STRAND	1221	1223	3
STRAND	1225	1227	3
TURN	1231	1232	2
STRAND	1235	1236	2
STRAND	1238	1242	5
STRAND	1245	1245	1
TURN	1247	1248	2
STRAND	1249	1249	1
STRAND	1252	1257	6
STRAND	1259	1261	3
STRAND	1263	1272	10
STRAND	1274	1274	1
TURN	1275	1276	2
STRAND	1277	1277	1
STRAND	1280	1286	7
HELIX	1287	1292	6
TURN	1293	1294	2
STRAND	1295	1297	3
TURN	1299	1300	2
STRAND	1302	1305	4
STRAND	1308	1308	1
TURN	1309	1310	2
STRAND	1311	1311	1

Sequence information

Length: **1314 AA** [This is the length of the unprocessed precursor]

Molecular weight: **150551 Da** [This is the MW of the unprocessed precursor]

CRC64: **134C3657133EF81D** is a checksum on the sequenc

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        10         20         30         40         50         60
PITINNFRYS DPVNNDTIIM MEPPYCKGLD IYYKAFKITD RIWIVPERYE FGTKPEDFNP

        70         80         90        100        110        120
PSSLIEGASE YYDPNYLRTD SDKDRFLQTM VKLFNRIKNN VAGEALLDKI INAIPYLGNS

       130        140        150        160        170        180
YSLLDKFDTN SNSVSFNLLE QDPSGATTKS AMLTNLIIFG PGPVLNKNEV RGIVLRVDNK

       190        200        210        220        230        240
NYFPCRDGFG SIMQMAFCPE YVPTFDNVIE NITSLTIGKS KYFQDPALLL MHELIHVLHG

       250        260        270        280        290        300
LYGMQVSSHE IIPSKQEIYM QHTYPISAEE LFTFGGQDAN LISIDIKNDL YEKTLNDYKA

       310        320        330        340        350        360
IANKLSQVTS CNDPNIDIDS YKQIYQQKYQ FDKDSNGQYI VNEDKFQILY NSIMYGFTEI

       370        380        390        400        410        420
ELGKKFNIKT RLSYFSMNHD PVKIPNLLDD TIYNDTEGFN IESKDLKSEY KGQNMRVNTN

       430        440        450        460        470        480
AFRNVDGSGL VSKLIGLCKK IIPPTNIREN LYNRTASLTD LGGELCIKIK NEDLTFIAEK

       490        500        510        520        530        540
NSFSEEPFQD EIVSYNTKNK PLNFNYSLDK IIVDYNLQSK ITLPNDRTTP VTKGIPYAPE

       550        560        570        580        590        600
YKSNAASTIE IHNIDDNTIY QYLYAQKSPT TLQRITMTNS VDDALINSTK IYSYFPSVIS

       610        620        630        640        650        660
KVNQGAQGIL FLQWVRDIID DFTNESSQKT TIDKISDVST IVPYIGPALN IVKQGYEGNF

       670        680        690        700        710        720
IGALETTGVV LLLEYIPEIT LPVIAALSIA ESSTQKEKII KTIDNFLEKR YEKWIEVYKL

       730        740        750        760        770        780
VKAKWLGTVN TQFQKRSYQM YRSLEYQVDA IKKIIDYEYK IYSGPDKEQI ADEINNLKNK

       790        800        810        820        830        840
LEEKANKAMI NINIFMRESS RSFLVNQMIN EAKKQLLEFD TQSKNILMQY IKANSKFIGI

       850        860        870        880        890        900
TELKKLESKI NKVFSTPIPF SYSKNLDCWV DNEEDIDVIL KKSTILNLDI NNDIISDISG

       910        920        930        940        950        960
FNSSVITYPD AQLVPGINGK AIHLVNNESS EVIVHKAMDI EYNDMFNNFT VSFWLRVPKV
```

```
       970        980        990       1000       1010       1020
SASHLEQYGT NEYSIISSMK KHSLSIGSGW SVSLKGNNLI WTLKDSAGEV RQITFRDLPD

      1030       1040       1050       1060       1070       1080
KFNAYLANKW VFITITNDRL SSANLYINGV LMGSAEITGL GAIREDNNIT LKLDRCNNNN

      1090       1100       1110       1120       1130       1140
QYVSIDKFRI FCKALNPKEI EKLYTSYLSI TFLRDFWGNP LRYDTEYYLI PVASSSKDVQ

      1150       1160       1170       1180       1190       1200
LKNITDYMYL TNAPSYTNGK LNIYYRRLYN GLKFIIKRYT PNNEIDSFVK SGDFIKLYVS

      1210       1220       1230       1240       1250       1260
YNNNEHIVGY PKDGNAFNNL DRILRVGYNA PGIPLYKKME AVKLRDLKTY SVQLKLYDDK

      1270       1280       1290       1300       1310
NASLGLVGTH NGQIGNDPNR DILIASNWYF NHLKDKILGC DWYFVPTDEG WTND
```

View entry in original UniProtKB/Swiss-Prot format
View entry in raw text format (no links)
Report form for errors/updates in this UniProtKB/Swiss-Prot entry

BLAST submission on ExPASy/SIB or at NCBI (USA)

Sequence analysis tools: ProtParam, ProtScale, Compute pI/Mw, PeptideMass, PeptideCutter, Dotlet (Java)

ScanProsite, MotifScan

Submit a homology modeling request to SWISS-MODEL

NPSA Sequence analysis tools

```
CLUSTAL W (1.82) multiple sequence alignment


sp|P04958|TETX_CLOTE          -PITINNFRYSDPVNNDTIIMMEPPYCKGLDIYYKAFKITDRIWIVPERY
sp|P10845|BXA1_CLOBO          -PFVNKQFNYKDPVNGVDIAYIKIPNVG-QMQPVKAFKIHNKIWVIPERD
sp|Q45894|BXA2_CLOBO          -PFVNKQFNYKDPVNGVDIAYIKIPNAG-QMQPVKAFKIHNKIWVIPERD
tr|Q58GH1|Q58GH1_CLOBO       MPFVNKQFNYKDPVNGVDIAYIKIPNAG-QMQPVKAFKIHNKIWVIPERD
tr|Q3LRX8|Q3LRX8_CLOBO       MPLVNQQINYYDPVNGVDIAYIKIPNAG-KMQPVKAFKIHNKVWVIPERD
                               *:. :::.* ****.  *  :: *         ***** :::*::***

sp|P04958|TETX_CLOTE          EFGTKPE-DFNPPSSLIEGASEYYDPNYLRTDSDKDRFLQTMVKLFNRIK
sp|P10845|BXA1_CLOBO          TFTNPEEGDLNPPPEAKQVPVSYYDSTYLSTDNEKDNYLKGVTKLFERIY
sp|Q45894|BXA2_CLOBO          TFTNPEEGDLNPPPEAKQVPVSYYDSTYLSTDNEKDNYLKGVTKLFERIY
tr|Q58GH1|Q58GH1_CLOBO       TFTNPEEGDLNPPPEAKQVPVSYYDSTYLSTDNEKDNYLKGVTKLFERIY
tr|Q3LRX8|Q3LRX8_CLOBO       IFTNPEEVDLNPPPEAKQVPISYYDSAYLSTDNEKDNYLKGVIKLFERIY
                               * .  * *:***..  : . .***. ** **.:**.:*: : ***:**

sp|P04958|TETX_CLOTE          NNVAGEALLDKIINAIPYLGNSYSLLDKFDTNSNSVSFNLLEQDPSGATT
sp|P10845|BXA1_CLOBO          STDLGRMLLTSIVRGIPFWGGSTIDTELKVIDTNCINVIQPDG------S
sp|Q45894|BXA2_CLOBO          STDLGRMLLTSIVRGIPFWGGSTIDTELKVIDTNCINVIQPDG------S
tr|Q58GH1|Q58GH1_CLOBO       STDLGRMLLTSIVRGIPFWGGSTIDTELKVIDTNCINVIQPDG------S
tr|Q3LRX8|Q3LRX8_CLOBO       STDLGRMLLISIVRGIPFWGGGKIDTELKVIDTNCINIIQLDD------S
                              ..  *. ** .*:..**: *..    :    ::*.:..   :       :

sp|P04958|TETX_CLOTE          KSAMLTNLIIFGPGPVLNKNEVRGIVLRVDNKNYFPCRDGFGSIMQMAFC
sp|P10845|BXA1_CLOBO          YRSEELNLVIIGPSADIIQFECKSFGHEVLN----LTRNGYGSTQYIRFS
sp|Q45894|BXA2_CLOBO          YRSEELNLVIIGPSADIIQFECKSFGHDVLN----LTRNGYGSTQYIRFS
tr|Q58GH1|Q58GH1_CLOBO       YRSEELNLVIIGPSADIIQFECKSFGHDVLN----LTRNGYGSTQYIRFS
tr|Q3LRX8|Q3LRX8_CLOBO       YRSEELNLAIIGPSANIIESQCSSFRDDVLN----LTRNGYGSTQYIRFS
                                :   ** *:**.. : : :  .:   * *      *:*:**   : *.

sp|P04958|TETX_CLOTE          PEYVPTFDNVIENITSLTIGKSKYFQDPALLLMHELIHVLHGLYGMQVSS
sp|P10845|BXA1_CLOBO          PDFTFGFEESLEVDTNPLLGAGKFATDPAVTLAHELIHAGHRLYGIAINP
sp|Q45894|BXA2_CLOBO          PDFTFGFEESLEVDTNPLLGAGKFATDPAVTLAHELIHAEHRLYGIAINP
tr|Q58GH1|Q58GH1_CLOBO       PDFTFGFEESLEVDTNPLLGAGKFATDPAVTLAHELIHAEHRLYGIAINP
tr|Q3LRX8|Q3LRX8_CLOBO       PDFTVGFEESLEVDTNPLLGAGKFAQDPAVALAHELIHAEHRLYGIAINT
                              *::.  *:: :*  *.  :* .*:  ***: * *****. * ***: :..

sp|P04958|TETX_CLOTE          HEIIPSKQEIYMQHT-YPISAEELFTFGGQDANLISIDIKNDLYEKTLND
sp|P10845|BXA1_CLOBO          NRVFKVNTNAYYEMSGLEVSFEELRTFGGHDAKFIDSLQENEFRLYYYNK
sp|Q45894|BXA2_CLOBO          NRVFKVNTNAYYEMSGLEVSFEELRTFGGHDAKFIDSLQENEFRLYYYNK
tr|Q58GH1|Q58GH1_CLOBO       NRVFKVNTNAYYEMSGLEVSFEELRTFGGHDAKFIDSLQENEFRLYYYNK
tr|Q3LRX8|Q3LRX8_CLOBO       NRVFKVNTNAYYEMAGLEVSLEELITFGGNDAKFIDSLQKKEFSLYYYNK
                              :.::  : : * : :   :* *** ****:**::*.   ::::     *.

sp|P04958|TETX_CLOTE          YKAIANKLSQVTSCNDPNIDIDSYKQIYQQKYQFDKDSNGQYIVNEDKFQ
sp|P10845|BXA1_CLOBO          FKDIASTLNKAKSIVGTTASLQYMKNVFKEKYLLSEDTSGKFSVDKLKFD
sp|Q45894|BXA2_CLOBO          FKDVASTLNKAKSIIGTTASLQYMKNVFKEKYLLSEDTSGKFSVDKLKFD
tr|Q58GH1|Q58GH1_CLOBO       FKDVASTLNKAKSIIGTTASLQYMKNVFKEKYLLSEDTSGKFSVDKLKFD
tr|Q3LRX8|Q3LRX8_CLOBO       FKDIASTLNKAKSIVGTTASLQYMKNVFKEKYLLSEDATGKFLVDRLKFD
                              :* :*..*.:..*  ... .::  *:::::** :.:*:.*:: *:. **:

sp|P04958|TETX_CLOTE          ILYNSIMYGFTEIELGKKFNIKTRLSYFSMNHDPVKIPNLLDDTIYNDTE
sp|P10845|BXA1_CLOBO          KLYKMLTEIYTEDNFVKFFKVLNRKTYLNFDKAVFKIN-IVPKVNYTIYD
sp|Q45894|BXA2_CLOBO          KLYKMLTEIYTEDNFVNFFKVINRKTYLNFDKAVFRIN-IVPDENYTIKD
tr|Q58GH1|Q58GH1_CLOBO       KLYKMLTEIYTEDNFVNFFKVINRKTYLNFDKAVFRIN-IVPDENYTIKD
tr|Q3LRX8|Q3LRX8_CLOBO       ELYKLLTEIYTEDNFVKFFKVLNRKTYLNFDKAVFKIN-IVPDVNYTIHD
                               **: :   :** :: : *:: .* :*:.:::  .:*  :: .  *.  :

sp|P04958|TETX_CLOTE          GFNIESKDLKSEYKGQNMRVNTNAFRNVD-GSGLVSKLIGLCKKIIPPTN
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sp|P10845|BXA1_CLOBO        GFNLRNTNLAANFNGQNTEINNMNFTKLKNFTGLFEFYKLLCVRGIITSK
sp|Q45894|BXA2_CLOBO        GFNLKGANLSTNFNGQNTEINSRNFTRLKNFTGLFEFYKLLCVRGIIPFK
tr|Q58GH1|Q58GH1_CLOBO     GFNLKGANLSTNFNGQNTEINSRNFTRLKNFTGLFEFYKLLCVRGIIPFK
tr|Q3LRX8|Q3LRX8_CLOBO     GFNLRNTNLAANFNGQNIEINNKNFDKLKNFTGLFEFYKLLCVRGIITSK
                            ***:.. :* ::::*** .:*.  * .:.  :**..    ** : * . :

sp|P04958|TETX_CLOTE        IRENLYNRTASLTDLGGELCIKIKNEDLTFIAEKNSFSEEPFQDEIVSYN
sp|P10845|BXA1_CLOBO        TKSLDKGYNKALN----DLCIKVNNWDLFFSPSEDNFTNDLNKGEEITSD
sp|Q45894|BXA2_CLOBO        TKSLDEGYNKALN----DLCIKVNNWDLFFSPSEDNFTNDLDKVEEITAD
tr|Q58GH1|Q58GH1_CLOBO     TKSLDEGYNKALN----DLCIKVNNWDLFFSPSEDNFTNDLDKVEEITAD
tr|Q3LRX8|Q3LRX8_CLOBO     TKSLDEGYNKALN----ELCIKVNNWDLFFSPSEDNFTNDLDKVEEITSD
                             :.   . . :*.    :****::* ** * ..::.*:::  : * :: :

sp|P04958|TETX_CLOTE        TKNKPLNFNYSLDKIIVDYNLQSKITLPNDRTTP---VTKGIPYAPEYKS
sp|P10845|BXA1_CLOBO        TNIEAAEENISLDLIQQYYLTFNFDNEPENISIENLSSDIIGQLELMPNI
sp|Q45894|BXA2_CLOBO        TNIEAAEENISLDLIQQYYLTFDFDNEPENISIENLSSDIIGQLEPMPNI
tr|Q58GH1|Q58GH1_CLOBO     TNIEAAEENISLDLIQQYYLTFDFDNEPENISIENLSSDIIGQLEPMPNI
tr|Q3LRX8|Q3LRX8_CLOBO     TNIEAAEENISLDLIQQYYLNFNFDNEPENTSIENLSSDIIGQLEPMPNI
                            *: :. : * *** *   *   .  . *:: :                 :

sp|P04958|TETX_CLOTE        NAASTIEIHNIDDNTIYQYLYAQKSPTTLQRITMTNSVDDALINSTKIYS
sp|P10845|BXA1_CLOBO        ERFPNGKKYELDKYTMFHYLRAQEFEHGKSRIALTNSVNEALLNPSRVYT
sp|Q45894|BXA2_CLOBO        ERFPNGKKYELDKYTMFHYLRAQEFEHGDSRIILTNSAEEALLKPNVAYT
tr|Q58GH1|Q58GH1_CLOBO     ERFPNGKKYELDKYTMFHYLRAQEFEHGDSRIILTNSAEEALLKPNVAYT
tr|Q3LRX8|Q3LRX8_CLOBO     ERFPNGKKYELNKYTMFHYLRAQEFKHSNSRIILTNSAKEALLKPNIVYT
                            :  .. : ::::. *:::** **:     .** :***..:**:..  *:

sp|P04958|TETX_CLOTE        YFPS-VISKVNQGAQGILFLQWVRDIIDDFTNESSQKTTIDKISDVSTIV
sp|P10845|BXA1_CLOBO        FFSSDYVKKVNKATEAAMFLGWVEQLVYDFTDETSEVSTTDKIADITIII
sp|Q45894|BXA2_CLOBO        FFSSKYVKKINKAVEAFMFLNWAEELVYDFTDETNEVTTMDKIADITIIV
tr|Q58GH1|Q58GH1_CLOBO     FFSSKYVKKINKAVEAFMFLNWAEELVYDFTDETNEVTTMDKIADITIIV
tr|Q3LRX8|Q3LRX8_CLOBO     FFSSKYIKAINKAVEAVTFVNWIENLVYDFTDETNEVSTMDKIADITIVI
                            :*.*  :. :*:..:.  *: * .::: ***:*:.: :* ***:*:: ::

sp|P04958|TETX_CLOTE        PYIGPALNIVKQGYEGNFIGALETTGVVLLLEYIPEITLPVIAALSIAES
sp|P10845|BXA1_CLOBO        PYIGPALNIGNMLYKDDFVGALIFSGAVILLEFIPEIAIPVLGTFALVSY
sp|Q45894|BXA2_CLOBO        PYIGPALNIGNMLSKGEFVEAIIFTGVVAMLEFIPEYALPVFGTFAIVSY
tr|Q58GH1|Q58GH1_CLOBO     PYIGPALNIGNMLSKGEFVEAIIFTGVVAMLEFIPEYALPVFGTFAIVSY
tr|Q3LRX8|Q3LRX8_CLOBO     PYIGPALNIGNMIYKGEFVEAIIFSGAVILLEIVPEIALPVLGTFALVSY
                            ********* :   :.:*: *:  :*.* :** :** ::**:.::::..

sp|P04958|TETX_CLOTE        STQKEKIIKTIDNFLEKRYEKWIEVYKLVKAKWLGTVNTQFQKRSYQMYR
sp|P10845|BXA1_CLOBO        IANKVLTVQTIDNALSKRNEKWDEVYKYIVTNWLAKVNTQIDLIRKKMKE
sp|Q45894|BXA2_CLOBO        IANKVLTVQTINNALSKRNEKWDEVYKYTVTNWLAKVNTQIDLIREKMKK
tr|Q58GH1|Q58GH1_CLOBO     IANKVLTVQTINNALSKRNEKWDEVYKYTVTNWLAKVNTQIDLIREKMKK
tr|Q3LRX8|Q3LRX8_CLOBO     VSNKVLTVQTIDNALSKRNEKWDEVYKYIVTNWLAIVNTQINLIREKMKK
                             ::*   ::**:* *.** *** ****   ::**. ****::    :* .

sp|P04958|TETX_CLOTE        SLEYQVDAIKKIIDYEYKIYSGPDKEQIADEINNLKNKLEEKANKAMINI
sp|P10845|BXA1_CLOBO        ALENQAEATKAIINYQYNQYTEEEKNNINFNIDDLSSKLNESINKAMINI
sp|Q45894|BXA2_CLOBO        ALENQAEATKAIINYQYNQYTEEEKNNINFNIDDLSSKLNESINSAMINI
tr|Q58GH1|Q58GH1_CLOBO     ALENQAEATKAIINYQYNQYTEEEKNNINFNIDDLSSKLNESINSAMINI
tr|Q3LRX8|Q3LRX8_CLOBO     ALENQAEATKAIINYQYNQYTEEEKNNINFNIDDLSSKLNESINSAMINI
                            :** *.:* * **:*:*: *:  :*::*  :*::*..**:*. *.*****

sp|P04958|TETX_CLOTE        NIFMRESSRSFLVNQMINEAKKQLLEFDTQSKNILMQYIKANSKFIGITE
sp|P10845|BXA1_CLOBO        NKFLNQCSVSYLMNSMIPYGVKRLEDFDASLKDALLKYIYDN-RGTLIGQ
sp|Q45894|BXA2_CLOBO        NKFLDQCSVSYLMNSMIPYAVKRLKDFDASVRDVLLKYIYDN-RGTLVLQ
tr|Q58GH1|Q58GH1_CLOBO     NKFLDQCSVSYLMNSMIPYAVKRLKDFDASVRDVLLKYIYDN-RGTLVLQ
tr|Q3LRX8|Q3LRX8_CLOBO     NKFLDQCSVSYLMNSMIPYAVKRLKDFDASVRDVLLKYIYDN-RGTLIGQ
```

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                                * *: :.* *:*:*.**  . *:* :**:. :: *::**  * :   : :

sp|P04958|TETX_CLOTE            LKKLESKINKVFSTPIPFSYSKNLD--CWVDNEEDIDVILKKSTILNLDI
sp|P10845|BXA1_CLOBO            VDRLKDKVNNTLSTDIPFQLSKYVDNQRLLSTFTEYIKNIINTSILNLRY
sp|Q45894|BXA2_CLOBO            VDRLKDEVNNTLSADIPFQLSKYVDNKKLLSTFTEYIKNIVNTSILSIVY
tr|Q58GH1|Q58GH1_CLOBO          VDRLKDEVNNTLSADIPFQLSKYVDNKKLLSTFTEYIKNIVNTSILSIVY
tr|Q3LRX8|Q3LRX8_CLOBO          VNRLKDKVNNTLSADIPFQLSKYVDNKKLLSTFTEYIKNITNASILSIVY
                                :.:*:.::*:.:*: ***. ** :*    :..  :    : :::**.:

sp|P04958|TETX_CLOTE            NNDIISDISGFNSSVITYPDAQLVPGINGKAIHLVNNESSEVIVHKAMDI
sp|P10845|BXA1_CLOBO            ESNHLIDLSRYA-SKINIGSKVNFDPIDKNQIQLFNLESSKIEVILKNAI
sp|Q45894|BXA2_CLOBO            KKDDLIDLSRYG-AKINIGDRVYYDSIDKNQIKLINLESSTIEVILKNAI
tr|Q58GH1|Q58GH1_CLOBO          KKDDLIDLSRYG-AKINIGDRVYYDSIDKNQIKLINLESSTIEVILKNAI
tr|Q3LRX8|Q3LRX8_CLOBO          KDDDLIDLSRYG-AEIYNGDKVYYNSIDKNQIRLINLESSTIEVILKKAI
                                :.: : *:* :  : *   .      *: : *:*.* *** : *     *

sp|P04958|TETX_CLOTE            EYNDMFNNFTVSFWLRVPKVSASHLEQYGTNEYSIISSMKKHSLSIGSGW
sp|P10845|BXA1_CLOBO            VYNSMYENFSTSFWIRIPKYFN---SISLNNEYTIINCMENN-----SGW
sp|Q45894|BXA2_CLOBO            VYNSMYENFSTSFWIKIPKYFS---KINLNNEYTIINCIENN-----SGW
tr|Q58GH1|Q58GH1_CLOBO          VYNSMYENFSTSFWIKIPKYFS---KINLNNEYTIINCIENN-----SGW
tr|Q3LRX8|Q3LRX8_CLOBO          VYNSMYENFSTSFWIRIPKYFN---SISLNNEYTIINCMENN-----SGW
                                 **.*::**:.***:::**      .   .***:**.::::     ***

sp|P04958|TETX_CLOTE            SVSLKGNNLIWTLKDSAGEVRQITFRDLPDKFNAYLANKWVFITITNDRL
sp|P10845|BXA1_CLOBO            KVSLNYGEIIWTLQDTQEIKQRVVFKYSQMINISDYINRWIFVTITNNRL
sp|Q45894|BXA2_CLOBO            KVSLNYGEIIWTLQDNKQNIQRVVFKYSQMVNISDYINRWIFVTITNNRL
tr|Q58GH1|Q58GH1_CLOBO          KVSLNYGEIIWTLQDNKQNIQRVVFKYSQMVNISDYINRWIFVTITNNRL
tr|Q3LRX8|Q3LRX8_CLOBO          KVSLNYGEIIWTFQDTQEIKQRVVFKYSQMINISDYINRWIFVTITNNRI
                                .***: .::***::*.    ::::.*:       :   *:*:*:****:*:

sp|P04958|TETX_CLOTE            SSANLYINGVLMGSAEITGLGAIREDNNITLKLDRCNNNNQYVSIDKFRI
sp|P10845|BXA1_CLOBO            NNSKIYINGRLIDQKPISNLGNIHASNNIMFKLDGCRDTHRYIWIKYFNL
sp|Q45894|BXA2_CLOBO            TKSKIYINGRLIDQKPISNLGNIHASNKIMFKLDGCRDPRRYIMIKYFNL
tr|Q58GH1|Q58GH1_CLOBO          TKSKIYINGRLIDQKPISNLGNIHASNKIMFKLDGCRDPRRYIMIKYFNL
tr|Q3LRX8|Q3LRX8_CLOBO          TKSKIYINGRLIDQKPISNLGNIHASNKIMFKLDGCRDPHRYIVIKYFNL
                                ..::::**** *:.  *:.** *: .*:* :*** *.: .:*: *. *.:

sp|P04958|TETX_CLOTE            FCKALNPKEIEKLYTSYLSITFLRDFWGNPLRYDTEYYLIPVASSSK--D
sp|P10845|BXA1_CLOBO            FDKELNEKEIKDLYDNQSNSGILKDFWGDYLQYDKPYYMLNLYDPNKYVD
sp|Q45894|BXA2_CLOBO            FDKELNEKEIKDLYDSQSNSGILKDFWGNYLQYDKPYYMLNLFDPNKYVD
tr|Q58GH1|Q58GH1_CLOBO          FDKELNEKEIKDLYDSQSNSGILKDFWGNYLQYDKPYYMLNLFDPNKYVD
tr|Q3LRX8|Q3LRX8_CLOBO          FDKELSEKEIKDLYDNQSNSGILKDFWGDYLQYDKSYYMLNLYDPNKYVD
                                * * *. ***:.** .  .  :*:****: *:**. **:: : ...*  *

sp|P04958|TETX_CLOTE            VQLKNITDYMYLTNAPSYTNGKLNIYYRRLYNGLKFIIKRYTPNNEIDSF
sp|P10845|BXA1_CLOBO            VNNVGIRGYMYLKGPRGSVMTTNIYLNSSLYRGTKFIIKKYASGN-KDNI
sp|Q45894|BXA2_CLOBO            VNNIGIRGYMYLKGPRGSVVTTNIYLNSTLYEGTKFIIKKYASGN-EDNI
tr|Q58GH1|Q58GH1_CLOBO          VNNIGIRGYMYLKGPRGSVVTTNIYLNSTLYEGTKFIIKKYASGN-EDNI
tr|Q3LRX8|Q3LRX8_CLOBO          VNNVGIRGYMYLKGPRDNVMTTNIYLNSSLYMGTKFIIKKYASGN-KDNI
                                *:  .* .****... . .  .       ** * *****:*:..*  *.:

sp|P04958|TETX_CLOTE            VKSGDFIKLYVSYNNNEHIVGYPKDGNAFNNLDRILRVGYNAPGIPLYKK
sp|P10845|BXA1_CLOBO            VRNNDRVYINVVVKNKEYRLATNASQAGVEKILSALEIPDVGN--LSQVV
sp|Q45894|BXA2_CLOBO            VRNNDRVYINVVVKNKEYRLATNASQAGVEKILSALEIPDVGN--LSQVV
tr|Q58GH1|Q58GH1_CLOBO          VRNNDRVYINVVVKNKEYRLATNASQAGVEKILSALEIPDVGN--LSQVV
tr|Q3LRX8|Q3LRX8_CLOBO          VRNNDRVYINVVVKNKEYRLATNASQAGVEKILSALEIPDVGN--LSQVV
                                *:..* : : *  :*:*: :.   .  ..:::   *.:   .

sp|P04958|TETX_CLOTE            MEAVKLRDLKTYSVQLKLYDDKNASLGLVGTHNGQIGNDPNRDILIASNW
sp|P10845|BXA1_CLOBO            VMKSKNDQGITNKCKMNLQDNNGNDIGFIGFH-----QFNNIAKLVASNW
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sp|Q45894|BXA2_CLOBO        VMKSKDDQGIRNKCKMNLQDNNGNDIGFIGFH-----LYDNIAKLVASNW
tr|Q58GH1|Q58GH1_CLOBO      VMKSKDDQGIRNKCKMNLQDNNGNDIGFIGFH-----LYDNIAKLVASNW
tr|Q3LRX8|Q3LRX8_CLOBO      VMKSKNDQGITNKCKMNLQDNNGNDIGFIGFH-----QFNNIAKLVASNW
                            :   *  :    . :::* *::. .:*::* *        *   *:****

sp|P04958|TETX_CLOTE        YFNHLK--DKILGCDWYFVPTDEGWTND--
sp|P10845|BXA1_CLOBO        YNRQIERSSRTLGCSWEFIPVDDGWGERPL
sp|Q45894|BXA2_CLOBO        YNRQVGKASRTFGCSWEFIPVDDGWGESSL
tr|Q58GH1|Q58GH1_CLOBO      YNRQVGKASRTFGCSWEFIPVDDGWGESSL
tr|Q3LRX8|Q3LRX8_CLOBO      YNRQIERSSRTLGCSWEFIPVDDGWRERPL
                            * .::   .: :**.* *:*.*:** :
```

PileUp

MSF: 1330 Type: P Check: 1777 ..

Name: sp|P04958|TETX_CLOTE oo Len: 1330 Check: 4312 Weight: 0.100
Name: sp|P10845|BXA1_CLOBO oo Len: 1330 Check: 3941 Weight: 0.100
Name: sp|Q45894|BXA2_CLOBO oo Len: 1330 Check: 1067 Weight: 0.100
Name: tr|Q58GH1|Q58GH1_CLOBO oo Len: 1330 Check: 1098 Weight: 0.100
Name: tr|Q3LRX8|Q3LRX8_CLOBO oo Len: 1330 Check: 1359 Weight: 0.100

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sp|P04958|TETX_CLOTE        .PITINNFRY SDPVNNDTII MMEPPYCKGL DIYYKAFKIT DRIWIVPERY
sp|P10845|BXA1_CLOBO        .PFVNKQFNY KDPVNGVDIA YIKIPNVG.Q MQPVKAFKIH NKIWVIPERD
sp|Q45894|BXA2_CLOBO        .PFVNKQFNY KDPVNGVDIA YIKIPNAG.Q MQPVKAFKIH NKIWVIPERD
tr|Q58GH1|Q58GH1_CLOBO      MPFVNKQFNY KDPVNGVDIA YIKIPNAG.Q MQPVKAFKIH NKIWVIPERD
tr|Q3LRX8|Q3LRX8_CLOBO      MPLVNQQINY YDPVNGVDIA YIKIPNAG.K MQPVKAFKIH NKVWVIPERD

sp|P04958|TETX_CLOTE        EFGTKPE.DF NPPSSLIEGA SEYYDPNYLR TDSDKDRFLQ TMVKLFNRIK
sp|P10845|BXA1_CLOBO        TFTNPEEGDL NPPPEAKQVP VSYYDSTYLS TDNEKDNYLK GVTKLFERIY
sp|Q45894|BXA2_CLOBO        TFTNPEEGDL NPPPEAKQVP VSYYDSTYLS TDNEKDNYLK GVTKLFERIY
tr|Q58GH1|Q58GH1_CLOBO      TFTNPEEGDL NPPPEAKQVP VSYYDSTYLS TDNEKDNYLK GVTKLFERIY
tr|Q3LRX8|Q3LRX8_CLOBO      IFTNPEEVDL NPPPEAKQVP ISYYDSAYLS TDNEKDNYLK GVIKLFERIY

sp|P04958|TETX_CLOTE        NNVAGEALLD KIINAIPYLG NSYSLLDKFD TNSNSVSFNL LEQDPSGATT
sp|P10845|BXA1_CLOBO        STDLGRMLLT SIVRGIPFWG GSTIDTELKV IDTNCINVIQ PDG......S
sp|Q45894|BXA2_CLOBO        STDLGRMLLT SIVRGIPFWG GSTIDTELKV IDTNCINVIQ PDG......S
tr|Q58GH1|Q58GH1_CLOBO      STDLGRMLLT SIVRGIPFWG GSTIDTELKV IDTNCINVIQ PDG......S
tr|Q3LRX8|Q3LRX8_CLOBO      STDLGRMLLI SIVRGIPFWG GGKIDTELKV IDTNCINIIQ LDD......S

sp|P04958|TETX_CLOTE        KSAMLTNLII FGPGPVLNKN EVRGIVLRVD NKNYFPCRDG FGSIMQMAFC
sp|P10845|BXA1_CLOBO        YRSEELNLVI IGPSADIIQF ECKSFGHEVL N....LTRNG YGSTQYIRFS
sp|Q45894|BXA2_CLOBO        YRSEELNLVI IGPSADIIQF ECKSFGHDVL N....LTRNG YGSTQYIRFS
tr|Q58GH1|Q58GH1_CLOBO      YRSEELNLVI IGPSADIIQF ECKSFGHDVL N....LTRNG YGSTQYIRFS
tr|Q3LRX8|Q3LRX8_CLOBO      YRSEELNLAI IGPSANIIES QCSSFRDDVL N....LTRNG YGSTQYIRFS

sp|P04958|TETX_CLOTE        PEYVPTFDNV IENITSLTIG KSKYFQDPAL LLMHELIHVL HGLYGMQVSS
sp|P10845|BXA1_CLOBO        PDFTFGFEES LEVDTNPLLG AGKFATDPAV TLAHELIHAG HRLYGIAINP
sp|Q45894|BXA2_CLOBO        PDFTFGFEES LEVDTNPLLG AGKFATDPAV TLAHELIHAE HRLYGIAINP
tr|Q58GH1|Q58GH1_CLOBO      PDFTFGFEES LEVDTNPLLG AGKFATDPAV TLAHELIHAE HRLYGIAINP
tr|Q3LRX8|Q3LRX8_CLOBO      PDFTVGFEES LEVDTNPLLG AGKFAQDPAV ALAHELIHAE HRLYGIAINT

sp|P04958|TETX_CLOTE        HEIIPSKQEI YMQHT.YPIS AEELFTFGGQ DANLISIDIK NDLYEKTLND
sp|P10845|BXA1_CLOBO        NRVFKVNTNA YYEMSGLEVS FEELRTFGGH DAKFIDSLQE NEFRLYYYNK
sp|Q45894|BXA2_CLOBO        NRVFKVNTNA YYEMSGLEVS FEELRTFGGH DAKFIDSLQE NEFRLYYYNK
tr|Q58GH1|Q58GH1_CLOBO      NRVFKVNTNA YYEMSGLEVS FEELRTFGGH DAKFIDSLQE NEFRLYYYNK
tr|Q3LRX8|Q3LRX8_CLOBO      NRVFKVNTNA YYEMAGLEVS LEELITFGGN DAKFIDSLQK KEFSLYYYNK

sp|P04958|TETX_CLOTE        YKAIANKLSQ VTSCNDPNID IDSYKQIYQQ KYQFDKDSNG QYIVNEDKFQ
sp|P10845|BXA1_CLOBO        FKDIASTLNK AKSIVGTTAS LQYMKNVFKE KYLLSEDTSG KFSVDKLKFD
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sp|Q45894|BXA2_CLOBO        FKDVASTLNK AKSIIGTTAS LQYMKNVFKE KYLLSEDTSG KFSVDKLKFD
tr|Q58GH1|Q58GH1_CLOBO      FKDVASTLNK AKSIIGTTAS LQYMKNVFKE KYLLSEDTSG KFSVDKLKFD
tr|Q3LRX8|Q3LRX8_CLOBO      FKDIASTLNK AKSIVGTTAS LQYMKNVFKE KYLLSEDATG KFLVDRLKFD


sp|P04958|TETX_CLOTE        ILYNSIMYGF TEIELGKKFN IKTRLSYFSM NHDPVKIPNL LDDTIYNDTE
sp|P10845|BXA1_CLOBO        KLYKMLTEIY TEDNFVKFFK VLNRKTYLNF DKAVFKIN.I VPKVNYTIYD
sp|Q45894|BXA2_CLOBO        KLYKMLTEIY TEDNFVNFFK VINRKTYLNF DKAVFRIN.I VPDENYTIKD
tr|Q58GH1|Q58GH1_CLOBO      KLYKMLTEIY TEDNFVNFFK VINRKTYLNF DKAVFRIN.I VPDENYTIKD
tr|Q3LRX8|Q3LRX8_CLOBO      ELYKLLTEIY TEDNFVKFFK VLNRKTYLNF DKAVFKIN.I VPDVNYTIHD


sp|P04958|TETX_CLOTE        GFNIESKDLK SEYKGQNMRV NTNAFRNVD. GSGLVSKLIG LCKKIIPPTN
sp|P10845|BXA1_CLOBO        GFNLRNTNLA ANFNGQNTEI NNMNFTKLKN FTGLFEFYKL LCVRGIITSK
sp|Q45894|BXA2_CLOBO        GFNLKGANLS TNFNGQNTEI NSRNFTRLKN FTGLFEFYKL LCVRGIIPFK
tr|Q58GH1|Q58GH1_CLOBO      GFNLKGANLS TNFNGQNTEI NSRNFTRLKN FTGLFEFYKL LCVRGIIPFK
tr|Q3LRX8|Q3LRX8_CLOBO      GFNLRNTNLA ANFNGQNIEI NNKNFDKLKN FTGLFEFYKL LCVRGIITSK


sp|P04958|TETX_CLOTE        IRENLYNRTA SLTDLGGELC IKIKNEDLTF IAEKNSFSEE PFQDEIVSYN
sp|P10845|BXA1_CLOBO        TKSLDKGYNK ALN....DLC IKVNNWDLFF SPSEDNFTND LNKGEEITSD
sp|Q45894|BXA2_CLOBO        TKSLDEGYNK ALN....DLC IKVNNWDLFF SPSEDNFTND LDKVEEITAD
tr|Q58GH1|Q58GH1_CLOBO      TKSLDEGYNK ALN....DLC IKVNNWDLFF SPSEDNFTND LDKVEEITAD
tr|Q3LRX8|Q3LRX8_CLOBO      TKSLDEGYNK ALN....ELC IKVNNWDLFF SPSEDNFTND LDKVEEITSD


sp|P04958|TETX_CLOTE        TKNKPLNFNY SLDKIIVDYN LQSKITLPND RTTP...VTK GIPYAPEYKS
sp|P10845|BXA1_CLOBO        TNIEAAEENI SLDLIQQYYL TFNFDNEPEN ISIENLSSDI IGQLELMPNI
sp|Q45894|BXA2_CLOBO        TNIEAAEENI SLDLIQQYYL TFDFDNEPEN ISIENLSSDI IGQLEPMPNI
tr|Q58GH1|Q58GH1_CLOBO      TNIEAAEENI SLDLIQQYYL TFDFDNEPEN ISIENLSSDI IGQLEPMPNI
tr|Q3LRX8|Q3LRX8_CLOBO      TNIEAAEENI SLDLIQQYYL NFNFDNEPEN TSIENLSSDI IGQLEPMPNI


sp|P04958|TETX_CLOTE        NAASTIEIHN IDDNTIYQYL YAQKSPTTLQ RITMTNSVDD ALINSTKIYS
sp|P10845|BXA1_CLOBO        ERFPNGKKYE LDKYTMFHYL RAQEFEHGKS RIALTNSVNE ALLNPSRVYT
sp|Q45894|BXA2_CLOBO        ERFPNGKKYE LDKYTMFHYL RAQEFEHGDS RIILTNSAEE ALLKPNVAYT
tr|Q58GH1|Q58GH1_CLOBO      ERFPNGKKYE LDKYTMFHYL RAQEFEHGDS RIILTNSAEE·ALLKPNVAYT
tr|Q3LRX8|Q3LRX8_CLOBO      ERFPNGKKYE LNKYTMFHYL RAQEFKHSNS RIILTNSAKE ALLKPNIVYT


sp|P04958|TETX_CLOTE        YFPS.VISKV NQGAQGILFL QWVRDIIDDF TNESSQKTTI DKISDVSTIV
sp|P10845|BXA1_CLOBO        FFSSDYVKKV NKATEAAMFL GWVEQLVYDF TDETSEVSTT DKIADITIII
sp|Q45894|BXA2_CLOBO        FFSSKYVKKI NKAVEAFMFL NWAEELVYDF TDETNEVTTM DKIADITIIV
tr|Q58GH1|Q58GH1_CLOBO      FFSSKYVKKI NKAVEAFMFL NWAEELVYDF TDETNEVTTM DKIADITIIV
tr|Q3LRX8|Q3LRX8_CLOBO      FFSSKYIKAI NKAVEAVTFV NWIENLVYDF TDETNEVSTM DKIADITIVI


sp|P04958|TETX_CLOTE        PYIGPALNIV KQGYEGNFIG ALETTGVVLL LEYIPEITLP VIAALSIAES
sp|P10845|BXA1_CLOBO        PYIGPALNIG NMLYKDDFVG ALIFSGAVIL LEFIPEIAIP VLGTFALVSY
sp|Q45894|BXA2_CLOBO        PYIGPALNIG NMLSKGEFVE AIIFTGVVAM LEFIPEYALP VFGTFAIVSY
tr|Q58GH1|Q58GH1_CLOBO      PYIGPALNIG NMLSKGEFVE AIIFTGVVAM LEFIPEYALP VFGTFAIVSY
tr|Q3LRX8|Q3LRX8_CLOBO      PYIGPALNIG NMIYKGEFVE AIIFSGAVIL LEIVPEIALP VLGTFALVSY


sp|P04958|TETX_CLOTE        STQKEKIIKT IDNFLEKRYE KWIEVYKLVK AKWLGTVNTQ FQKRSYQMYR
sp|P10845|BXA1_CLOBO        IANKVLTVQT IDNALSKRNE KWDEVYKYIV TNWLAKVNTQ IDLIRKKMKE
sp|Q45894|BXA2_CLOBO        IANKVLTVQT INNALSKRNE KWDEVYKYTV TNWLAKVNTQ IDLIREKMKK
tr|Q58GH1|Q58GH1_CLOBO      IANKVLTVQT INNALSKRNE KWDEVYKYTV TNWLAKVNTQ IDLIREKMKK
tr|Q3LRX8|Q3LRX8_CLOBO      VSNKVLTVQT IDNALSKRNE KWDEVYKYIV TNWLAIVNTQ INLIREKMKK
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sp|P04958|TETX_CLOTE        SLEYQVDAIK KIIDYEYKIY SGPDKEQIAD EINNLKNKLE EKANKAMINI
sp|P10845|BXA1_CLOBO        ALENQAEATK AIINYQYNQY TEEEKNNINF NIDDLSSKLN ESINKAMINI
sp|Q45894|BXA2_CLOBO        ALENQAEATK AIINYQYNQY TEEEKNNINF NIDDLSSKLN ESINSAMINI
tr|Q58GH1|Q58GH1_CLOBO      ALENQAEATK AIINYQYNQY TEEEKNNINF NIDDLSSKLN ESINSAMINI
tr|Q3LRX8|Q3LRX8_CLOBO      ALENQAEATK AIINYQYNQY TEEEKNNINF NIDDLSSKLN ESINSAMINI

sp|P04958|TETX_CLOTE        NIFMRESSRS FLVNQMINEA KKQLLEFDTQ SKNILMQYIK ANSKFIGITE
sp|P10845|BXA1_CLOBO        NKFLNQCSVS YLMNSMIPYG VKRLEDFDAS LKDALLKYIY DN.RGTLIGQ
sp|Q45894|BXA2_CLOBO        NKFLDQCSVS YLMNSMIPYA VKRLKDFDAS VRDVLLKYIY DN.RGTLVLQ
tr|Q58GH1|Q58GH1_CLOBO      NKFLDQCSVS YLMNSMIPYA VKRLKDFDAS VRDVLLKYIY DN.RGTLVLQ
tr|Q3LRX8|Q3LRX8_CLOBO      NKFLDQCSVS YLMNSMIPYA VKRLKDFDAS VRDVLLKYIY DN.RGTLIGQ

sp|P04958|TETX_CLOTE        LKKLESKINK VFSTPIPFSY SKNLD..CWV DNEEDIDVIL KKSTILNLDI
sp|P10845|BXA1_CLOBO        VDRLKDKVNN TLSTDIPFQL SKYVDNQRLL STFTEYIKNI INTSILNLRY
sp|Q45894|BXA2_CLOBO        VDRLKDEVNN TLSADIPFQL SKYVDNKKLL STFTEYIKNI VNTSILSIVY
tr|Q58GH1|Q58GH1_CLOBO      VDRLKDEVNN TLSADIPFQL SKYVDNKKLL STFTEYIKNI VNTSILSIVY
tr|Q3LRX8|Q3LRX8_CLOBO      VNRLKDKVNN TLSADIPFQL SKYVDNKKLL STFTEYIKNI TNASILSIVY

sp|P04958|TETX_CLOTE        NNDIISDISG FNSSVITYPD AQLVPGINGK AIHLVNNESS EVIVHKAMDI
sp|P10845|BXA1_CLOBO        ESNHLIDLSR YA.SKINIGS KVNFDPIDKN QIQLFNLESS KIEVILKNAI
sp|Q45894|BXA2_CLOBO        KKDDLIDLSR YG.AKINIGD RVYYDSIDKN QIKLINLESS TIEVILKNAI
tr|Q58GH1|Q58GH1_CLOBO      KKDDLIDLSR YG.AKINIGD RVYYDSIDKN QIKLINLESS TIEVILKNAI
tr|Q3LRX8|Q3LRX8_CLOBO      KDDDLIDLSR YG.AEIYNGD KVYYNSIDKN QIRLINLESS TIEVILKKAI

sp|P04958|TETX_CLOTE        EYNDMFNNFT VSFWLRVPKV SASHLEQYGT NEYSIISSMK KHSLSIGSGW
sp|P10845|BXA1_CLOBO        VYNSMYENFS TSFWIRIPKY FN...SISLN NEYTIINCME NN.....SGW
sp|Q45894|BXA2_CLOBO        VYNSMYENFS TSFWIKIPKY FS...KINLN NEYTIINCIE NN.....SGW
tr|Q58GH1|Q58GH1_CLOBO      VYNSMYENFS TSFWIKIPKY FS...KINLN NEYTIINCIE NN.....SGW
tr|Q3LRX8|Q3LRX8_CLOBO      VYNSMYENFS TSFWIRIPKY FN...SISLN NEYTIINCME NN.....SGW

sp|P04958|TETX_CLOTE        SVSLKGNNLI WTLKDSAGEV RQITFRDLPD KFNAYLANKW VFITITNDRL
sp|P10845|BXA1_CLOBO        KVSLNYGEII WTLQDTQEIK QRVVFKYSQM INISDYINRW IFVTITNNRL
sp|Q45894|BXA2_CLOBO        KVSLNYGEII WTLQDNKQNI QRVVFKYSQM VNISDYINRW IFVTITNNRL
tr|Q58GH1|Q58GH1_CLOBO      KVSLNYGEII WTLQDNKQNI QRVVFKYSQM VNISDYINRW IFVTITNNRL
tr|Q3LRX8|Q3LRX8_CLOBO      KVSLNYGEII WTFQDTQEIK QRVVFKYSQM INISDYINRW IFVTITNNRI

sp|P04958|TETX_CLOTE        SSANLYINGV LMGSAEITGL GAIREDNNIT LKLDRCNNNN QYVSIDKFRI
sp|P10845|BXA1_CLOBO        NNSKIYINGR LIDQKPISNL GNIHASNNIM FKLDGCRDTH RYIWIKYFNL
sp|Q45894|BXA2_CLOBO        TKSKIYINGR LIDQKPISNL GNIHASNKIM FKLDGCRDPR RYIMIKYFNL
tr|Q58GH1|Q58GH1_CLOBO      TKSKIYINGR LIDQKPISNL GNIHASNKIM FKLDGCRDPR RYIMIKYFNL
tr|Q3LRX8|Q3LRX8_CLOBO      TKSKIYINGR LIDQKPISNL GNIHASNKIM FKLDGCRDPH RYIVIKYFNL

sp|P04958|TETX_CLOTE        FCKALNPKEI EKLYTSYLSI TFLRDFWGNP LRYDTEYYLI PVASSSK..D
sp|P10845|BXA1_CLOBO        FDKELNEKEI KDLYDNQSNS GILKDFWGDY LQYDKPYYML NLYDPNKYVD
sp|Q45894|BXA2_CLOBO        FDKELNEKEI KDLYDSQSNS GILKDFWGNY LQYDKPYYML NLFDPNKYVD
tr|Q58GH1|Q58GH1_CLOBO      FDKELNEKEI KDLYDSQSNS GILKDFWGNY LQYDKPYYML NLFDPNKYVD
tr|Q3LRX8|Q3LRX8_CLOBO      FDKELSEKEI KDLYDNQSNS GILKDFWGDY LQYDKSYYML NLYDPNKYVD

sp|P04958|TETX_CLOTE        VQLKNITDYM YLTNAPSYTN GKLNIYYRRL YNGLKFIIKR YTPNNEIDSF
sp|P10845|BXA1_CLOBO        VNNVGIRGYM YLKGPRGSVM TTNIYLNSSL YRGTKFIIKK YASGN.KDNI
sp|Q45894|BXA2_CLOBO        VNNIGIRGYM YLKGPRGSVV TTNIYLNSTL YEGTKFIIKK YASGN.EDNI
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tr|Q58GH1|Q58GH1_CLOBO      VNNIGIRGYM YLKGPRGSVV TTNIYLNSTL YEGTKFIIKK YASGN.EDNI
tr|Q3LRX8|Q3LRX8_CLOBO      VNNVGIRGYM YLKGPRDNVM TTNIYLNSSL YMGTKFIIKK YASGN.KDNI


sp|P04958|TETX_CLOTE        VKSGDFIKLY VSYNNNEHIV GYPKDGNAFN NLDRILRVGY NAPGIPLYKK
sp|P10845|BXA1_CLOBO        VRNNDRVYIN VVVKNKEYRL ATNASQAGVE KILSALEIPD VGN..LSQVV
sp|Q45894|BXA2_CLOBO        VRNNDRVYIN VVVKNKEYRL ATNASQAGVE KILSALEIPD VGN..LSQVV
tr|Q58GH1|Q58GH1_CLOBO      VRNNDRVYIN VVVKNKEYRL ATNASQAGVE KILSALEIPD VGN..LSQVV
tr|Q3LRX8|Q3LRX8_CLOBO      VRNNDRVYIN VVVKNKEYRL ATNASQAGVE KILSALEIPD VGN..LSQVV


sp|P04958|TETX_CLOTE        MEAVKLRDLK TYSVQLKLYD DKNASLGLVG THNGQIGNDP NRDILIASNW
sp|P10845|BXA1_CLOBO        VMKSKNDQGI TNKCKMNLQD NNGNDIGFIG FH.....QFN NIAKLVASNW
sp|Q45894|BXA2_CLOBO        VMKSKDDQGI RNKCKMNLQD NNGNDIGFIG FH.....LYD NIAKLVASNW
tr|Q58GH1|Q58GH1_CLOBO      VMKSKDDQGI RNKCKMNLQD NNGNDIGFIG FH.....LYD NIAKLVASNW
tr|Q3LRX8|Q3LRX8_CLOBO      VMKSKNDQGI TNKCKMNLQD NNGNDIGFIG FH.....QFN NIAKLVASNW


sp|P04958|TETX_CLOTE        YFNHLK..DK ILGCDWYFVP TDEGWTND..
sp|P10845|BXA1_CLOBO        YNRQIERSSR TLGCSWEFIP VDDGWGERPL
sp|Q45894|BXA2_CLOBO        YNRQVGKASR TFGCSWEFIP VDDGWGESSL
tr|Q58GH1|Q58GH1_CLOBO      YNRQVGKASR TFGCSWEFIP VDDGWGESSL
tr|Q3LRX8|Q3LRX8_CLOBO      YNRQIERSSR TLGCSWEFIP VDDGWRERPL
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CLUSTAL FORMAT for T-COFFEE Version_1.37, CPU=0.26 sec, SCORE=16750, Nseq=2, Len=134

unk|VIRT1624|Blast_submission  -PITINNFRYSDPVNNDTIIMMEPPYCKGLDIYYKAFKITDRIWIVPERYEFG
tr|Q7B8V4|Q7B8V4_CLOBO         MPFVNKQFNYKDPVNGVDIAYIKIPNA-GQMQPVKAFKIHNKIWVIPERDTFT
                                *:. ::*.*.****.  *  :: * . *     ***** ::**::***  *

unk|VIRT1624|Blast_submission  NPPSSLIEGASEYYDPNYLRTDSDKDRFLQTMVKLFNRIKNNVAGEALLDKII
tr|Q7B8V4|Q7B8V4_CLOBO         NPPPEAKQVPVSYYDSTYLSTDNEKDNYLKGVTKLFERIYSTDLGRMLLTSIV
                               ***..  : . .***..** **.:**.:*: :.***:** ..  *. ** .*:

unk|VIRT1624|Blast_submission  NSYSLLDKFDTNSNSVSFNLLEQDPSGATTKSAMLTNLIIFGPGPVLNKNEVR
tr|Q7B8V4|Q7B8V4_CLOBO         GS-----TIDTELKVIDTNCINVIQPDGSYRSEEL-NLVIIGPSADIIQFECK
                               .*     .:**: : :. * ::   ...: :*  * **:*:**.. : : * :

unk|VIRT1624|Blast_submission  NKNYFPCRDGFGSIMQMAFCPEYVPTFDNVIENITSLTIGKSKYFQDPALLLM
tr|Q7B8V4|Q7B8V4_CLOBO         NLT----RNGYGSTQYIRFSPDFTFGFEESLEVDTNPLLGAGKFATDPAVTLA
                               * .    *:*:**   : *.*::.  *:: :*  *.  :* .*:  ***: *

unk|VIRT1624|Blast_submission  HGLYGMQVSSHEIIPSKQEIYMQHT-YPISAEELFTFGGQDANLISIDIKNDL
tr|Q7B8V4|Q7B8V4_CLOBO         HRLYGIAINPNRVFKVNTNAYYEMSGLEVSFEELRTFGGHDAKFIDSLQENEF
                               * ***: :..:.::  : : * : :   :* *** ****:**::*.   :*::

unk|VIRT1624|Blast_submission  YKAIANKLSQVTSCNDPNIDIDSYKQIYQQKYQFDKDSNGQYIVNEDKFQILY
tr|Q7B8V4|Q7B8V4_CLOBO         FKDIASTLNKAKSIVGTTASLQYMKNVFKEKYLLSEDTSGKFSVDKLKFDKLY
                               :* **..*.:..*  ... .::  *:::::** :.:*:.*:: *:: **: **

unk|VIRT1624|Blast_submission  TEIELGKKFNIKTRLSYFSMNHDPVKIPNLLDDTIYNDTEGFNIESKDLKSEY
tr|Q7B8V4|Q7B8V4_CLOBO         TEDNFVKFFKVLNRKTYLNFDKAVFKI-NIVPKVNYTIYDGFNLRNTNLAANF
                               ** :: * *:: .* :*:.:::  .** *:: .. *.  :***:...:* :::

unk|VIRT1624|Blast_submission  NTNAF---RNVDGSGLVSKLIGLCKKIIPPTNIRENLYNRTASLTDLGGELCI
tr|Q7B8V4|Q7B8V4_CLOBO         NNMNFTKLKNFTGLFEFYKLLCVRGIITSKTKSLDKGYNKALN------DLCI
                               *.  *   :*. *   . **: :   * . *:  :: **:: .      :***

unk|VIRT1624|Blast_submission  TFIAEKNSFSEEPFQDEIVSYNTKNKPLNFNYSLDKIIVDY------NLQSKI
tr|Q7B8V4|Q7B8V4_CLOBO         FFSPSEDNFTNDLNKGEEITSDTNIEAAEENISLDLIQQYYLTFNFDNEPENI
                                * ..:::.*:::  :.* :: :*: :. : * *** *   *      *  .:*

unk|VIRT1624|Blast_submission  TPVTKGIPYAPEYKSNAASTIEIHNIDDNTIYQYLYAQKSPTTLQRITMTNSV
tr|Q7B8V4|Q7B8V4_CLOBO         SDIIGQLELMPNIERFPNG--KKYELDKYTMFHYLRAQEFEHGKSRIALTNSV
                               : :   :   *: :  . .  : :::*. *:::** **:     .**::****

unk|VIRT1624|Blast_submission  TKIYSYFPS-VISKVNQGAQGILFLQWVRDIIDDFTNESSQKTTIDKISDVST
tr|Q7B8V4|Q7B8V4_CLOBO         SRVYTFFSSDYVKKVNKATEAAMFLGWVEQLVYDFTDETSEVSTTDKIADITI
                               :::*::*.*  :.***:.::. :** **.::: ***:*:*: :* ***:*::

unk|VIRT1624|Blast_submission  ALNIVKQGYEGNFIGALETTGVVLLLEYIPEITLPVIAALSIAESSTQKEKII
tr|Q7B8V4|Q7B8V4_CLOBO         ALNIGNMLYKDDFVGALIFSGAVILLEFIPEIAIPVLGTFALVSYIANKVLTV
                               **** :  *:.:*:***  :*.*:***:****::**:.::::..  ::*   :

unk|VIRT1624|Blast_submission  EKRYEKWIEVYKLVKAKWLGTVNTQFQKRSYQMYRSLEYQVDAIKKIIDYEYK
tr|Q7B8V4|Q7B8V4_CLOBO         SKRNEKWDEVYKYIVTNWLAKVNTQIDLIRKKMKEALENQAEATKAIINYQYN
                               .** *** **** : ::**..****::    :* .:** *.:* * **:*:*:

unk|VIRT1624|Blast_submission  EQIADEINNLKNKLEEKANKAMININIFMRESSRSFLVNQMINEAKKQLLEFD
tr|Q7B8V4|Q7B8V4_CLOBO         NNINFNIDDLSSKLNESINKAMININKFLNQCSVSYLMNSMIPYGVKRLEDFD
                               ::*  :*::*..**:*. ******** *:.:.* *:*:*.**  . *:* :**

unk|VIRT1624|Blast_submission  MQYIKANSKFIGITELKKLESKINKVFSTPIPFSYSKNLDCWVDNEEDIDVIL
tr|Q7B8V4|Q7B8V4_CLOBO         LKYIYDNRGTL-IGQVDRLKDKVNNTLSTDIPFQLSK----YVDNQRLLSTFT
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                                ::**  *   : * ::.:*:.*:*:.:** ***. **    :***:. :..:

unk|VIRT1624|Blast_submission   KSTILNLDINNDIISDISGFNSSVITYPDAQLVPGINGKAIHLVNNESSEVIV
tr|Q7B8V4|Q7B8V4_CLOBO          NTSILNLRYESNHLIDLSRYASKINIGSKVNFDP-IDKNQIQLFNLESSKIEV
                                :::**** :.: : *:* : *.:   ...:: * *: : *:*.* ***:: *

unk|VIRT1624|Blast_submission   YNDMFNNFTVSFWLRVPKVSASHLEQYGTNEYSIISSMKKHSLSIGSGWSVSL
tr|Q7B8V4|Q7B8V4_CLOBO          YNSMYENFSTSFWIRIPKYFNSISL---NNEYTIINCMENN-----SGWKVSL
                                **.*::**:.***:*:**   *      .***:**..*:::     ***.***

unk|VIRT1624|Blast_submission   TLKDSAGEVRQITFRDLPDKFNAYLANKWVFITITNDRLSSANLYINGVLMGS
tr|Q7B8V4|Q7B8V4_CLOBO          TLQDTQEIKQRVVFKYSQMINISDYINRWIFVTITNNRLNNSKIYINGRLIDQ
                                **:*:    :::.*:       :   *:*:*:****:**..:::**** *:..

unk|VIRT1624|Blast_submission   AIREDNNITLKLDRCNNNNQYVSIDKFRIFCKALNPKEIEKLYTSYLSITFLR
tr|Q7B8V4|Q7B8V4_CLOBO          NIHASNNIMFKLDGCRDTHRYIWIKYFNLFDKELNEKEIKDLYDNQSNSGILK
                                 *: .*** :*** *.:.::*: *. *.:* * ** ***:.** .  .  :*:

unk|VIRT1624|Blast_submission   RYDTEYYLIPVASSSKDVQLKN--ITDYMYLTNAPSYTNGKLNIYYRR-LYNG
tr|Q7B8V4|Q7B8V4_CLOBO          QYDKPYYMLNLYDPNKYVDVNNVGIRGYMYL-KGPRGSVMTTNIYLNSSLYRG
                                :**. **:: : ...* *:::*  * .**** :.*  :  . *** .  **.*

unk|VIRT1624|Blast_submission   YTPNNEIDSFVKSGDFIKLYVSYNNNEHIVGYPKDGNAFNNLDRILRVGYNAP
tr|Q7B8V4|Q7B8V4_CLOBO          YASGNK-DNIVRNNDRVYINVVVKNKEYRLATNASQAGVEKILSALEI----P
                                *:..*: *.:*:..* : : *  :*:*: :.   .  ..:::   *.:    *

unk|VIRT1624|Blast_submission   MEAVKLRDLK--TYSVQLKLYDDKNASLGLVGTHNGQIGNDPNRDILIASNWY
tr|Q7B8V4|Q7B8V4_CLOBO          VVVMKSKNDQGITNKCKMNLQDNNGNDIGFIGFHQF------NNIAKLVASNW
                                : .:* :: :  * . :::* *::. .:*::* *:       *.   :.:. :

unk|VIRT1624|Blast_submission   KDKILGCDWYFVPTDEGWTND--
tr|Q7B8V4|Q7B8V4_CLOBO          SSRTLGCSWEFIPVDDGWGERPL
                                ..: ***.* *:*.*:** :
```

tr Q7B8V4 BoNT/A (Neurotoxin BoNT) [bont/a] [Clostridium botulinum]
Q7B8V4_CLOBO

Score = 649 bits (1674), Expect = 0.0

Identities = 438/1339 (32%), Positives = 683/1339 (50%), Gaps = 77/1339 (5%)

Query: 1 PITINNFRYSDPVNNDTIIMMEPPYCKGLDIYYKAFKITDRIWIVPERYI
P F Y DPVN I ++ P + KAFKI ++IW++PER F T PE D
Sbjct: 2 PFVNKQFNYKDPVNGVDIAYIKIPNAGQMQPV-KAFKIHNKIWVIPERD

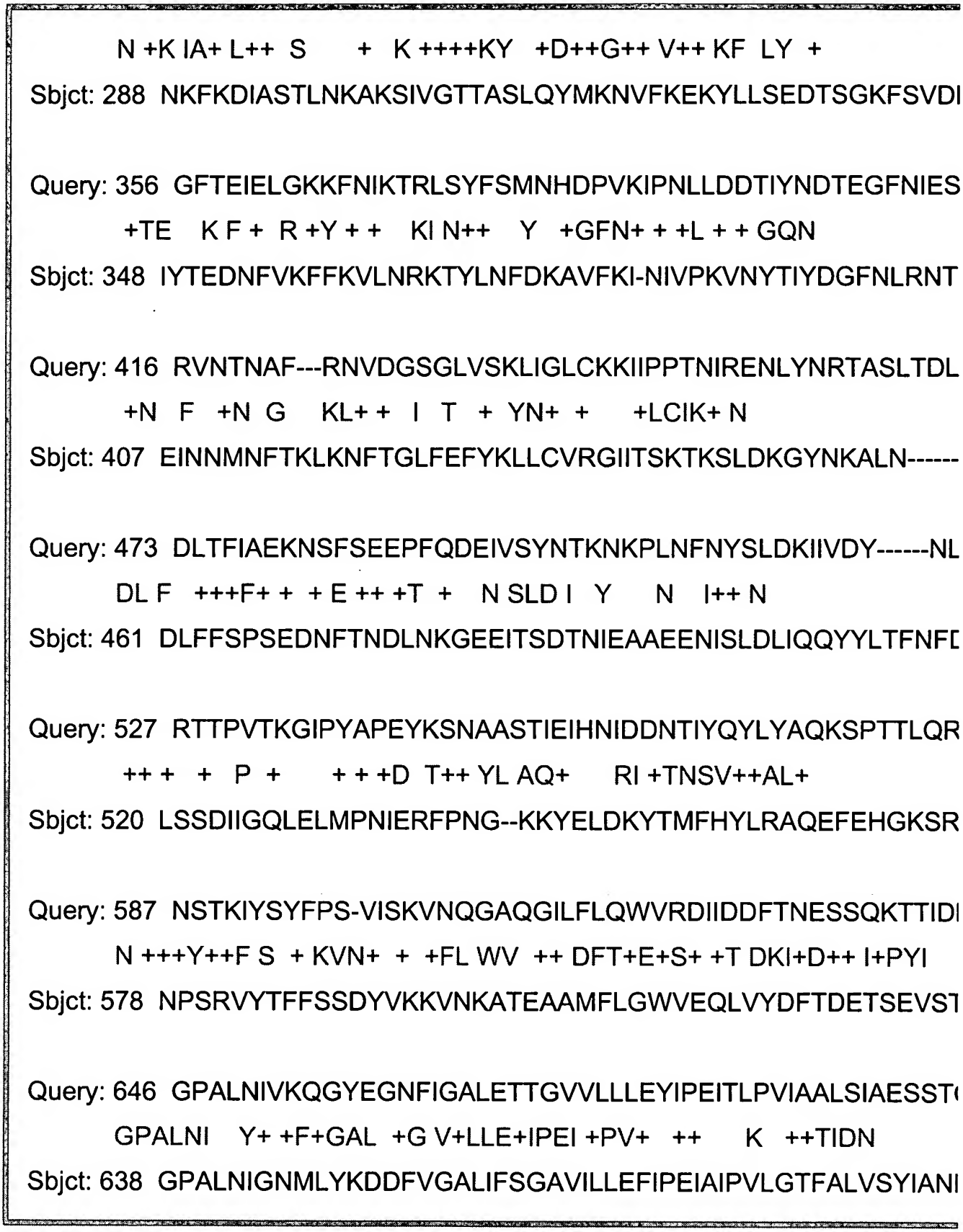
Query: 59 NPPSSLIEGASEYYDPNYLRTDSDKDRFLQTMVKLFNRIKNNVAGE
NPP + YYD YL TD++KD +L+ + KLF RI + G LL I+ IP+ G
Sbjct: 60 NPPPEAKQVPVSYYDSTYLSTDNEKDNYLKGVTKLFERIYSTDLGRM

Query: 119 NSY--SLLDKFDTNSNSVSFNLLEQDPSGATTKSAMLTNLIIFGPGP
S + L DTN N+++ D S + + NL+I GP + + E +
Sbjct: 120 GSTIDTELKVIDTNC----INVIQPDGSYRSEE----LNLVIIGPSADIIQFEC

Query: 177 VDNKNYFPCRDGFGSIMQMAFCPEYVPTFDNVIENITSLTIGKSKYF
V N R+G+GS + F P++ F+ +E T+ +G K+ DPA+ L HELIH
Sbjct: 172 VLNLT----RNGYGSTQYIRFSPDFTFGFEESLEVDTNPLLGAGKFATD

Query: 237 VLHGLYGMQVSSHEIIPSKQEIYMQHT-YPISAEELFTFGGQDANLIS
H LYG+ ++ + + Y + + +S EEL TFGG DA I +N+
Sbjct: 228 AGHRLYGIAINPNRVFKVNTNAYYEMSGLEVSFEELRTFGGHDAKFI

Query: 296 NDYKAIANKLSQVTSCNDPNIDIDSYKQIYQQKYQFDKDSNGQYIVN


N +K IA+ L++ S + K ++++KY +D++G++ V++ KF LY +
Sbjct: 288 NKFKDIASTLNKAKSIVGTTASLQYMKNVFKEKYLLSEDTSGKFSVDI
Query: 356 GFTEIELGKKFNIKTRLSYFSMNHDPVKIPNLLDDTIYNDTEGFNIES
+TE K F + R +Y + + KI N++ Y +GFN+ + +L + + GQN
Sbjct: 348 IYTEDNFVKFFKVLNRKTYLNFDKAVFKI-NIVPKVNYTIYDGFNLRNT
Query: 416 RVNTNAF---RNVDGSGLVSKLIGLCKKIIPPTNIRENLYNRTASLTDL
+N F +N G KL+ + I T + YN+ + +LCIK+ N
Sbjct: 407 EINNMNFTKLKNFTGLFEFYKLLCVRGIITSKTKSLDKGYNKALN------
Query: 473 DLTFIAEKNSFSEEPFQDEIVSYNTKNKPLNFNYSLDKIIVDY------NL
DL F +++F+ + + E ++ +T + N SLD I Y N I++ N
Sbjct: 461 DLFFSPSEDNFTNDLNKGEEITSDTNIEAAEENISLDLIQQYYLTFNFI
Query: 527 RTTPVTKGIPYAPEYKSNAASTIEIHNIDDNTIYQYLYAQKSPTTLQR
++ + + P + + + +D T++ YL AQ+ RI +TNSV++AL+
Sbjct: 520 LSSDIIGQLELMPNIERFPNG--KKYELDKYTMFHYLRAQEFEHGKSR
Query: 587 NSTKIYSYFPS-VISKVNQGAQGILFLQWVRDIIDDFTNESSQKTTIDI
N +++Y++F S + KVN+ + +FL WV ++ DFT+E+S+ +T DKI+D++ I+PYI
Sbjct: 578 NPSRVYTFFSSDYVKKVNKATEAAMFLGWVEQLVYDFTDETSEVST
Query: 646 GPALNIVKQGYEGNFIGALETTGVVLLLEYIPEITLPVIAALSIAESST
GPALNI Y+ +F+GAL +G V+LLE+IPEI +PV+ ++ K ++TIDN
Sbjct: 638 GPALNIGNMLYKDDFVGALIFSGAVILLEFIPEIAIPVLGTFALVSYIANI

Query: 706 FLEKRYEKWIEVYKLVKAKWLGTVNTQFQKRSYQMYRSLEYQVDA
L KR EKW EVYK + WL VNTQ +M +LE Q +A +
Sbjct: 698 ALSKRNEKWDEVYKYIVTNWLAKVNTQIDLIRKKMKEALENQAEATK

Query: 766 DKEQIADEIXXXXXXXXXXXXXXMININIFMRESSRSFLVNQMINEAI
+K I I MININ F+ + S S+L+N MI K+L +FD K+
Sbjct: 758 EKNNINFNIDDLSSKLNESINKAMININKFLNQCSVSYLMNSMIPYGVI

Query: 826 ILMQYIKANSKFIGITELKKLESKINKVFSTPIPFSYSKNLDCWVDNEI
L++YI N + I ++ +L+ K+N ST IPF SK +VDN+ + +
Sbjct: 818 ALLKYIYDNRGTL-IGQVDRLKDKVNNTLSTDIPFQLSK----YVDNQRL

Query: 883 --STXXXXXXXXXXXXXXGFNSSVITYPDAQLVPGINGKAIHLVNNE
+T +S I I+ I L N ESS++ V I
Sbjct: 873 IINTSILNLRYESNHLIDLSRYASKINIGSKVNFDPIDKNQIQLFNLESSI

Query: 941 EYNDMFNNFTVSFWLRVPKVSASHLEQYGTNEYSIISSMKKHSLSI
YN M+ NF+ SFW+R+PK S NEY+II+ M+ + SGW VSL +I
Sbjct: 933 VYNSMYENFSTSFWIRIPKYFNSISL---NNEYTIINCMENN-----SGWK

Query: 1001 WTLKDSAGEVRQITFRDLPDKFNAYLANKWVFITITNDRLSSANLY
WTL+D+ +++ F+ + N+W+F+TITN+RL+++ +YING L+ I+ L
Sbjct: 985 WTLQDTQEIKQRVVFKYSQMINISDYINRWIFVTITNNRLNNSKIYING

Query: 1061 GAIREDNNITLKLDRCNNNNQYVSIDKFRIFCKALNPKEIEKLYTSYI

```
          G I  NNI  KLD C + ++Y+ I  F +F K LN KEI+ LY +  +  L+DFWG+
Sbjct: 1045 GNIHASNNIMFKLDGCRDTHRYIWIKYFNLFDKELNEKEIKDLYDNQ

Query: 1121 LRYDTEYYLIPVASSSKDVQLKN--ITDYMYLTNAPSYTNGKLNIYYF
          L+YD  YY++ +  +K V + N  I  YMYL   P  +   NIY   LY G KFIIK
Sbjct: 1105 LQYDKPYYMLNLYDPNKYVDVNNVGIRGYMYL-KGPRGSVMTTNIY

Query: 1178 RYTPNNEIDSFVKSGDFIKLYVSYNNNEHIVGYPKDGNAFN-NLDR
          +Y   N+ D+ V++ D + + V   N E   Y   NA   +++IL     P +
Sbjct: 1164 KYASGNK-DNIVRNNDRVYINVVVKNKE----YRLATNASQAGVEKILS

Query: 1237 KKMEAVKLRDLK--TYSVQLKLYDDKNASLGLVGTHNGQIGNDPNF
          ++  +K ++ +  T  ++ L D+   +G +G H  Q  N     L+ASNWY  ++
Sbjct: 1218 SQVVVMKSKNDQGITNKCKMNLQDNNGNDIGFIGFH--QFNNIAK---

Query: 1295 --DKILGCDWYFVPTDEGW 1311
            + LGC W F+P D+GW
Sbjct: 1273 RSSRTLGCSWEFIPVDDGW 1291
```

sp	P10845 BXA1_CLOBO	Botulinum neurotoxin type A precursor (EC 3.4.24.69) (BoNT/A) (Bontoxilysin A) (BOTOX) [Contains: Botulinum neurotoxin A light-chain; Botulinum neurotoxin A heavy-chain] [botA] [Clostridium botulinum]

Identities = 438/1339 (32%), Positives = 683/1339 (50%), Gaps = 77/1339 (5%)

```
Query: 1    PITINNFRYSDPVNNDTIIMMEPPYCKGLDIYYKAFKITDRIWIVPERYI
             P    F Y DPVN   I  ++ P    +   KAFKI ++IW++PER  F T PE  D
Sbjct: 1    PFVNKQFNYKDPVNGVDIAYIKIPNVGQMQPV-KAFKIHNKIWVIPERD

Query: 59   NPPSSLIEGASEYYDPNYLRTDSDKDRFLQTMVKLFNRIKNNVAGE/
             NPP    +    YYD  YL TD++KD +L+ + KLF RI +   G  LL  I+  IP+ G
Sbjct: 59   NPPPEAKQVPVSYYDSTYLSTDNEKDNYLKGVTKLFERIYSTDLGRM

Query: 119  NSY--SLLDKFDTNSNSVSFNLLEQDPSGATTKSAMLTNLIIFGPGPV
             S   + L   DTN      N+++ D S  + +     NL+I GP   + + E +
Sbjct: 119  GSTIDTELKVIDTNC----INVIQPDGSYRSEE----LNLVIIGPSADIIQFEC

Query: 177  VDNKNYFPCRDGFGSIMQMAFCPEYVPTFDNVIENITSLTIGKSKYF
             V N     R+G+GS   + F P++   F+  +E  T+  +G  K+  DPA+ L HELIH
Sbjct: 171  VLNLT----RNGYGSTQYIRFSPDFTFGFEESLEVDTNPLLGAGKFATD

Query: 237  VLHGLYGMQVSSHEIIPSKQEIYMQHT-YPISAEELFTFGGQDANLIS
             H LYG+ ++ + +      Y + +  +S EEL TFGG DA  I   +N+
Sbjct: 227  AGHRLYGIAINPNRVFKVNTNAYYEMSGLEVSFEELRTFGGHDAKFI

Query: 296  NDYKAIANKLSQVTSCNDPNIDIDSYKQIYQQKYQFDKDSNGQYIVN
             N +K IA+ L++  S      +  K ++++KY   +D++G++ V++ KF  LY  +
Sbjct: 287  NKFKDIASTLNKAKSIVGTTASLQYMKNVFKEKYLLSEDTSGKFSVDI
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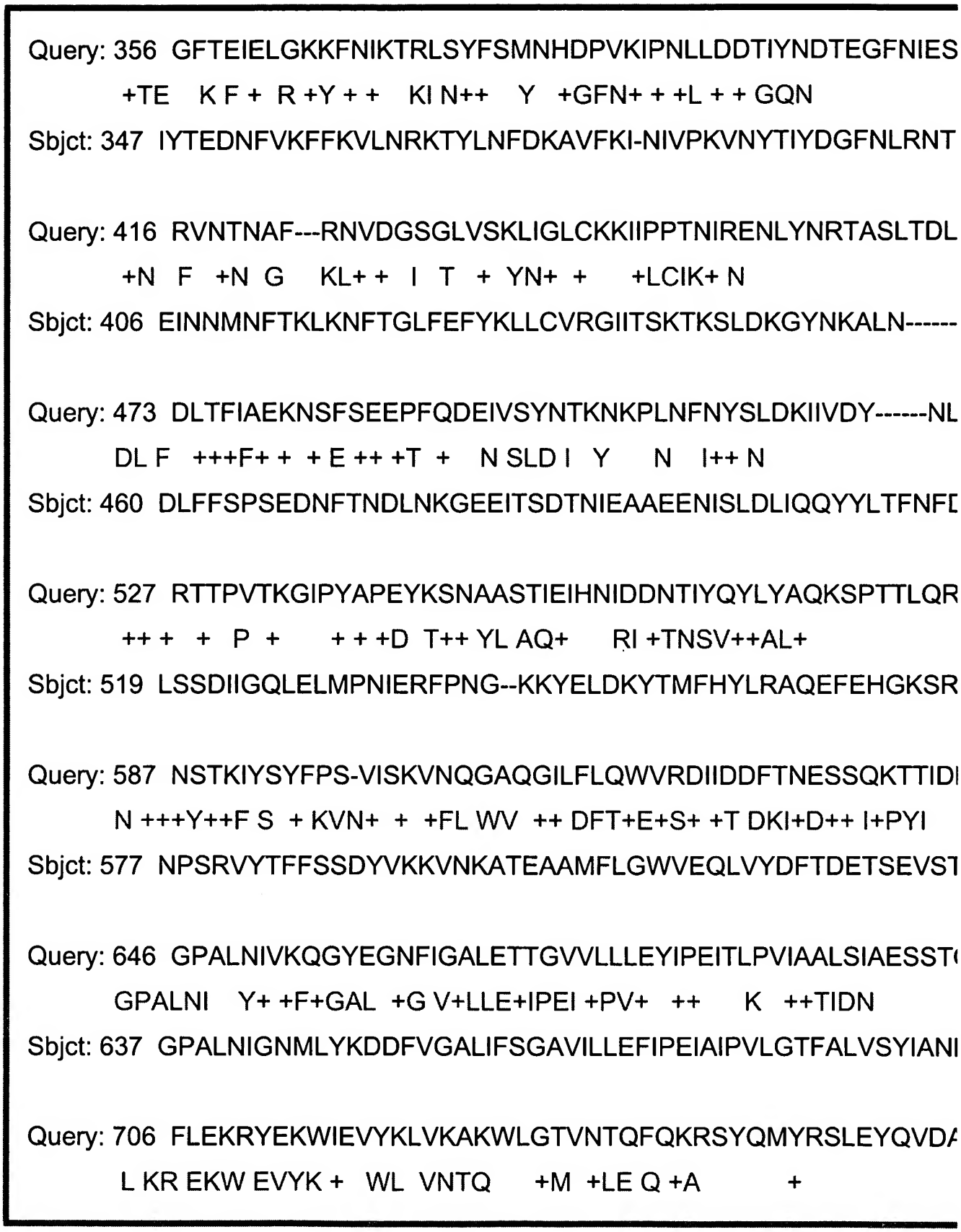
Query: 356 GFTEIELGKKFNIKTRLSYFSMNHDPVKIPNLLDDTIYNDTEGFNIES
+TE K F + R +Y + + KI N++ Y +GFN+ + +L + + GQN
Sbjct: 347 IYTEDNFVKFFKVLNRKTYLNFDKAVFKI-NIVPKVNYTIYDGFNLRNT
Query: 416 RVNTNAF---RNVDGSGLVSKLIGLCKKIIPPTNIRENLYNRTASLTDL
+N F +N G KL+ + I T + YN+ + +LCIK+ N
Sbjct: 406 EINNMNFTKLKNFTGLFEFYKLLCVRGIITSKTKSLDKGYNKALN------
Query: 473 DLTFIAEKNSFSEEPFQDEIVSYNTKNKPLNFNYSLDKIIVDY------NL
DL F +++F+ + + E ++ +T + N SLD I Y N I++ N
Sbjct: 460 DLFFSPSEDNFTNDLNKGEEITSDTNIEAAEENISLDLIQQYYLTFNFI
Query: 527 RTTPVTKGIPYAPEYKSNAASTIEIHNIDDNTIYQYLYAQKSPTTLQR
++ + + P + + + +D T++ YL AQ+ RI +TNSV++AL+
Sbjct: 519 LSSDIIGQLELMPNIERFPNG--KKYELDKYTMFHYLRAQEFEHGKSR
Query: 587 NSTKIYSYFPS-VISKVNQGAQGILFLQWVRDIIDDFTNESSQKTTIDI
N +++Y++F S + KVN+ + +FL WV ++ DFT+E+S+ +T DKI+D++ I+PYI
Sbjct: 577 NPSRVYTFFSSDYVKKVNKATEAAMFLGWVEQLVYDFTDETSEVST
Query: 646 GPALNIVKQGYEGNFIGALETTGVVLLLEYIPEITLPVIAALSIAESST
GPALNI Y+ +F+GAL +G V+LLE+IPEI +PV+ ++ K ++TIDN
Sbjct: 637 GPALNIGNMLYKDDFVGALIFSGAVILLEFIPEIAIPVLGTFALVSYIANI
Query: 706 FLEKRYEKWIEVYKLVKAKWLGTVNTQFQKRSYQMYRSLEYQVDA
L KR EKW EVYK + WL VNTQ +M +LE Q +A +


Sbjct: 697 ALSKRNEKWDEVYKYIVTNWLAKVNTQIDLIRKKMKEALENQAEATK
Query: 766 DKEQIADEIXXXXXXXXXXXXXXMININIFMRESSRSFLVNQMINEAI
+K I I MININ F+ + S S+L+N MI K+L +FD K+
Sbjct: 757 EKNNINFNIDDLSSKLNESINKAMININKFLNQCSVSYLMNSMIPYGVI
Query: 826 ILMQYIKANSKFIGITELKKLESKINKVFSTPIPFSYSKNLDCWVDNEI
L++YI N + I ++ +L+ K+N ST IPF SK +VDN+ + +
Sbjct: 817 ALLKYIYDNRGTL-IGQVDRLKDKVNNTLSTDIPFQLSK----YVDNQRL
Query: 883 --STXXXXXXXXXXXXXXGFNSSVITYPDAQLVPGINGKAIHLVNNE
+T +S I I+ I L N ESS++ V I
Sbjct: 872 IINTSILNLRYESNHLIDLSRYASKINIGSKVNFDPIDKNQIQLFNLESSI
Query: 941 EYNDMFNNFTVSFWLRVPKVSASHLEQYGTNEYSIISSMKKHSLSI
YN M+ NF+ SFW+R+PK S NEY+II+ M+ + SGW VSL +I
Sbjct: 932 VYNSMYENFSTSFWIRIPKYFNSISL---NNEYTIINCMENN-----SGWK
Query: 1001 WTLKDSAGEVRQITFRDLPDKFNAYLANKWVFITITNDRLSSANLY
WTL+D+ +++ F+ + N+W+F+TITN+RL+++ +YING L+ I+ L
Sbjct: 984 WTLQDTQEIKQRVVFKYSQMINISDYINRWIFVTITNNRLNNSKIYING
Query: 1061 GAIREDNNITLKLDRCNNNNQYVSIDKFRIFCKALNPKEIEKLYTSYI
G I NNI KLD C + ++Y+ I F +F K LN KEI+ LY + + L+DFWG+
Sbjct: 1044 GNIHASNNIMFKLDGCRDTHRYIWIKYFNLFDKELNEKEIKDLYDNQ

Query: 1121 LRYDTEYYLIPVASSSKDVQLKN--ITDYMYLTNAPSYTNGKLNIYYF

L+YD YY++ + +K V + N I YMYL P + NIY LY G KFIIK

Sbjct: 1104 LQYDKPYYMLNLYDPNKYVDVNNVGIRGYMYL-KGPRGSVMTTNIY

Query: 1178 RYTPNNEIDSFVKSGDFIKLYVSYNNNEHIVGYPKDGNAFN-NLDR

+Y N+ D+ V++ D + + V N E Y NA +++IL P +

Sbjct: 1163 KYASGNK-DNIVRNNDRVYINVVVKNKE----YRLATNASQAGVEKILS

Query: 1237 KKMEAVKLRDLK--TYSVQLKLYDDKNASLGLVGTHNGQIGNDPNF

++ +K ++ + T ++ L D+ +G +G H Q N L+ASNWY ++

Sbjct: 1217 SQVVVMKSKNDQGITNKCKMNLQDNNGNDIGFIGFH--QFNNIAK---

Query: 1295 --DKILGCDWYFVPTDEGW 1311

+ LGC W F+P D+GW

Sbjct: 1272 RSSRTLGCSWEFIPVDDGW 1290

tr Q7B8V4 **BoNT/A (Neurotoxin BoNT) [bont/a] [Clostridium**
Q7B8V4_CLOBO **botulinum]**

Score = 649 bits (1674), Expect = 0.0
Identities = 438/1339 (32%), Positives = 683/1339 (50%), Gaps = 77

```
Query: 1    PITINNFRYSDPVNNDTIIMMEPPYCKGLDIYYKAFKITDRIWIVPERYEFGTKP
             P     F Y DPVN   I  ++ P    +    KAFKI ++IW++PER  F T P
Sbjct: 2    PFVNKQFNYKDPVNGVDIAYIKIPNAGQMQPV-KAFKIHNKIWVIPERDTF-TNP

Query: 59   NPPSSLIEGASEYYDPNYLRTDSDKDRFLQTMVKLFNRIKNNVAGEALLDKIINA
             NPP    +    YYD  YL TD++KD +L+ + KLF RI +   G  LL  I+
Sbjct: 60   NPPPEAKQVPVSYYDSTYLSTDNEKDNYLKGVTKLFERIYSTDLGRMLLTSIVRG

Query: 119  NSY--SLLDKFDTNSNSVSFNLLEQDPSGATTKSAMLTNLIIFGPGPVLNKNEVR
              S   + L   DTN      N+++ D S  + +     NL+I GP   + + E +
Sbjct: 120  GSTIDTELKVIDTNC----INVIQPDGSYRSEE----LNLVIIGPSADIIQFECK

Query: 177  VDNKNYFPCRDGFGSIMQMAFCPEYVPTFDNVIENITSLTIGKSKYFQDPALLLM
             V N      R+G+GS   + F P++   F+  +E  T+  +G  K+  DPA+ L
Sbjct: 172  VLNLT----RNGYGSTQYIRFSPDFTFGFEESLEVDTNPLLGAGKFATDPAVTLA

Query: 237  VLHGLYGMQVSSHEIIPSKQEIYMQHT-YPISAEELFTFGGQDANLISIDIKNDL
               H LYG+ ++ + +        Y + +   +S EEL TFGG DA  I    +N+
Sbjct: 228  AGHRLYGIAINPNRVFKVNTNAYYEMSGLEVSFEELRTFGGHDAKFIDSLQENEF

Query: 296  NDYKAIANKLSQVTSCNDPNIDIDSYKQIYQQKYQFDKDSNGQYIVNEDKFQILY
             N +K IA+ L++  S       +   K ++++KY   +D++G++ V++ KF  LY
Sbjct: 288  NKFKDIASTLNKAKSIVGTTASLQYMKNVFKEKYLLSEDTSGKFSVDKLKFDKLY

Query: 356  GFTEIELGKKFNIKTRLSYFSMNHDPVKIPNLLDDTIYNDTEGFNIESKDLKSEY
              +TE    K F +  R +Y + +    KI N++    Y   +GFN+ + +L + +
Sbjct: 348  IYTEDNFVKFFKVLNRKTYLNFDKAVFKI-NIVPKVNYTIYDGFNLRNTNLAANF

Query: 416  RVNTNAF---RNVDGSGLVSKLIGLCKKIIPPTNIRENLYNRTASLTDLGGELCI
              +N   F   +N  G     KL+ +   I   T   + YN+  +       +LCI
Sbjct: 407  EINNMNFTKLKNFTGLFEFYKLLCVRGIITSKTKSLDKGYNKALN------DLCI

Query: 473  DLTFIAEKNSFSEEPFQDEIVSYNTKNKPLNFNYSLDKIIVDY------NLQSKI
             DL F   +++F+ +  + E ++ +T  +    N SLD I   Y      N    I
Sbjct: 461  DLFFSPSEDNFTNDLNKGEEITSDTNIEAAEENISLDLIQQYYLTFNFDNEPENI

Query: 527  RTTPVTKGIPYAPEYKSNAASTIEIHNIDDNTIYQYLYAQKSPTTLQRITMTNSV
              ++ +   +   P  +       + + +D  T++ YL AQ+      RI +TNSV
Sbjct: 520  LSSDIIGQLELMPNIERFPNG--KKYELDKYTMFHYLRAQEFEHGKSRIALTNSV

Query: 587  NSTKIYSYFPS-VISKVNQGAQGILFLQWVRDIIDDFTNESSQKTTIDKISDVST
```

```
            N +++Y++F S  + KVN+  +  +FL WV  ++ DFT+E+S+ +T DKI+D++
Sbjct: 578  NPSRVYTFFSSDYVKKVNKATEAAMFLGWVEQLVYDFTDETSEVSTTDKIADITI

Query: 646  GPALNIVKQGYEGNFIGALETTGVVLLLEYIPEITLPVIAALSIAESSTQKEKII
            GPALNI    Y+ +F+GAL  +G V+LLE+IPEI +PV+   ++      K   +
Sbjct: 638  GPALNIGNMLYKDDFVGALIFSGAVILLEFIPEIAIPVLGTFALVSYIANKVLTV

Query: 706  FLEKRYEKWIEVYKLVKAKWLGTVNTQFQKRSYQMYRSLEYQVDAXXXXXXXXXX
             L KR EKW EVYK +   WL  VNTQ      +M  +LE Q +A
Sbjct: 698  ALSKRNEKWDEVYKYIVTNWLAKVNTQIDLIRKKMKEALENQAEATKAIINYQYN

Query: 766  DKEQIADEIXXXXXXXXXXXXXXMININIFMRESSRSFLVNQMINEAKKQLLEFD
            +K  I   I               MININ F+ + S S+L+N MI    K+L +FD
Sbjct: 758  EKNNINFNIDDLSSKLNESINKAMININKFLNQCSVSYLMNSMIPYGVKRLEDFD

Query: 826  ILMQYIKANSKFIGITELKKLESKINKVFSTPIPFSYSKNLDCWVDNEEDIDVIL
             L++YI  N   + I ++ +L+ K+N   ST IPF  SK    +VDN+  +
Sbjct: 818  ALLKYIYDNRGTL-IGQVDRLKDKVNNTLSTDIPFQLSK----YVDNQRLLSTFT

Query: 883  --STXXXXXXXXXXXXXXGFNSSVITYPDAQLVPGINGKAIHLVNNESSEVIVH
              +T                  +S I          I+   I L N ESS++ V
Sbjct: 873  IINTSILNLRYESNHLIDLSRYASKINIGSKVNFDPIDKNQIQLFNLESSKIEVI

Query: 941  EYNDMFNNFTVSFWLRVPKVSASHLEQYGTNEYSIISSMKKHSLSIGSGWSVSLK
             YN M+ NF+ SFW+R+PK   S       NEY+II+ M+ +     SGW VSL
Sbjct: 933  VYNSMYENFSTSFWIRIPKYFNSISL---NNEYTIINCMENN-----SGWKVSLN

Query: 1001 WTLKDSAGEVRQITFRDLPDKFNAYLANKWVFITITNDRLSSANLYINGVLMGSA
            WTL+D+    +++ F+       +   N+W+F+TITN+RL+++ +YING L+
Sbjct: 985  WTLQDTQEIKQRVVFKYSQMINISDYINRWIFVTITNNRLNNSKIYINGRLIDQK

Query: 1061 GAIREDNNITLKLDRCNNNNQYVSIDKFRIFCKALNPKEIEKLYTSYLSITFLRD
            G I   NNI  KLD C + ++Y+ I  F +F K LN KEI+ LY +  +   L+D
Sbjct: 1045 GNIHASNNIMFKLDGCRDTHRYIWIKYFNLFDKELNEKEIKDLYDNQSNSGILKD

Query: 1121 LRYDTEYYLIPVASSSKDVQLKN--ITDYMYLTNAPSYTNGKLNIYYR-RLYNGL
            L+YD  YY++ +   +K V + N  I  YMYL   P  +    NIY    LY G
Sbjct: 1105 LQYDKPYYMLNLYDPNKYVDVNNVGIRGYMYL-KGPRGSVMTTNIYLNSSLYRGT

Query: 1178 RYTPNNEIDSFVKSGDFIKLYVSYNNNEHIVGYPKDGNAFN-NLDRILRVGYNAP
            +Y   N+ D+ V++ D + + V   N E    Y    NA    +++IL      P
Sbjct: 1164 KYASGNK-DNIVRNNDRVYINVVVKNKE----YRLATNASQAGVEKILS-ALEIP

Query: 1237 KKMEAVKLRDLK--TYSVQLKLYDDKNASLGLVGTHNGQIGNDPNRDILIASNWY
             ++  +K ++ +  T   ++ L D+    +G +G H  Q  N      L+ASNWY
Sbjct: 1218 SQVVVMKSKNDQGITNKCKMNLQDNNGNDIGFIGFH--QFNNIAK---LVASNWY
```

```
Query: 1295 --DKILGCDWYFVPTDEGW 1311
               + LGC W F+P D+GW
Sbjct: 1273 RSSRTLGCSWEFIPVDDGW 1291
```

sp P10845 BXA1_CLOBO **Botulinum neurotoxin type A precursor (EC 3.4.24.69) (BoNT/A) (Bontoxilysin A) (BOTOX) [Contains: Botulinum neurotoxin A light-chain; Botulinum neurotoxin A heavy-chain] [botA] [Clostridium botulinum]**

Score = 649 bits (1673), Expect = 0.0
Identities = 438/1339 (32%), Positives = 683/1339 (50%), Gaps = 77

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Query: 1    PITINNFRYSDPVNNDTIIMMEPPYCKGLDIYYKAFKITDRIWIVPERYEFGTKP
            P     F Y DPVN   I  ++ P    +    KAFKI ++IW++PER  F T P
Sbjct: 1    PFVNKQFNYKDPVNGVDIAYIKIPNVGQMQPV-KAFKIHNKIWVIPERDTF-TNP

Query: 59   NPPSSLIEGASEYYDPNYLRTDSDKDRFLQTMVKLFNRIKNNVAGEALLDKIINA
            NPP    +    YYD  YL TD++KD +L+ + KLF RI +   G  LL  I+
Sbjct: 59   NPPPEAKQVPVSYYDSTYLSTDNEKDNYLKGVTKLFERIYSTDLGRMLLTSIVRG

Query: 119  NSY--SLLDKFDTNSNSVSFNLLEQDPSGATTKSAMLTNLIIFGPGPVLNKNEVR
              .      S   + L   DTN      N+++ D S  + +     NL+I GP   + + E +
Sbjct: 119  GSTIDTELKVIDTNC----INVIQPDGSYRSEE----LNLVIIGPSADIIQFECK

Query: 177  VDNKNYFPCRDGFGSIMQMAFCPEYVPTFDNVIENITSLTIGKSKYFQDPALLLM
            V N      R+G+GS   + F P++   F+  +E  T+  +G  K+  DPA+ L
Sbjct: 171  VLNLT----RNGYGSTQYIRFSPDFTFGFEESLEVDTNPLLGAGKFATDPAVTLA

Query: 237  VLHGLYGMQVSSHEIIPSKQEIYMQHT-YPISAEELFTFGGQDANLISIDIKNDL
             H LYG+ ++ + +       Y + +   +S EEL TFGG DA  I    +N+
Sbjct: 227  AGHRLYGIAINPNRVFKVNTNAYYEMSGLEVSFEELRTFGGHDAKFIDSLQENEF

Query: 296  NDYKAIANKLSQVTSCNDPNIDIDSYKQIYQQKYQFDKDSNGQYIVNEDKFQILY
            N +K IA+ L++  S       +   K ++++KY   +D++G++ V++ KF  LY
Sbjct: 287  NKFKDIASTLNKAKSIVGTTASLQYMKNVFKEKYLLSEDTSGKFSVDKLKFDKLY

Query: 356  GFTEIELGKKFNIKTRLSYFSMNHDPVKIPNLLDDTIYNDTEGFNIESKDLKSEY
             +TE    K F +  R +Y + +    KI N++    Y   +GFN+ + +L + +
Sbjct: 347  IYTEDNFVKFFKVLNRKTYLNFDKAVFKI-NIVPKVNYTIYDGFNLRNTNLAANF

Query: 416  RVNTNAF---RNVDGSGLVSKLIGLCKKIIPPTNIRENLYNRTASLTDLGGELCI
             +N   F   +N  G     KL+ +   I   T   +  YN+  +       +LCI
Sbjct: 406  EINNMNFTKLKNFTGLFEFYKLLCVRGIITSKTKSLDKGYNKALN------DLCI
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Query: 473  DLTFIAEKNSFSEEPFQDEIVSYNTKNKPLNFNYSLDKIIVDY------NLQSKI
            DL F    +++F+ +   + E ++ +T   +    N SLD I   Y      N   I
Sbjct: 460  DLFFSPSEDNFTNDLNKGEEITSDTNIEAAEENISLDLIQQYYLTFNFDNEPENI

Query: 527  RTTPVTKGIPYAPEYKSNAASTIEIHNIDDNTIYQYLYAQKSPTTLQRITMTNSV
             ++ +    +    P   +          + + +D  T++ YL AQ+       RI +TNSV
Sbjct: 519  LSSDIIGQLELMPNIERFPNG--KKYELDKYTMFHYLRAQEFEHGKSRIALTNSV

Query: 587  NSTKIYSYFPS-VISKVNQGAQGILFLQWVRDIIDDFTNESSQKTTIDKISDVST
            N +++Y++F S   + KVN+   +  +FL WV   ++ DFT+E+S+ +T DKI+D++
Sbjct: 577  NPSRVYTFFSSDYVKKVNKATEAAMFLGWVEQLVYDFTDETSEVSTTDKIADITI

Query: 646  GPALNIVKQGYEGNFIGALETTGVVLLLEYIPEITLPVIAALSIAESSTQKEKII
            GPALNI     Y+ +F+GAL   +G V+LLE+IPEI +PV+     ++        K    +
Sbjct: 637  GPALNIGNMLYKDDFVGALIFSGAVILLEFIPEIAIPVLGTFALVSYIANKVLTV

Query: 706  FLEKRYEKWIEVYKLVKAKWLGTVNTQFQKRSYQMYRSLEYQVDAXXXXXXXXXX
             L KR EKW EVYK +    WL  VNTQ        +M   +LE Q +A
Sbjct: 697  ALSKRNEKWDEVYKYIVTNWLAKVNTQIDLIRKKMKEALENQAEATKAIINYQYN

Query: 766  DKEQIADEIXXXXXXXXXXXXXXMININIFMRESSRSFLVNQMINEAKKQLLEFD
            +K  I   I                MININ F+ + S S+L+N MI    K+L +FD
Sbjct: 757  EKNNINFNIDDLSSKLNESINKAMININKFLNQCSVSYLMNSMIPYGVKRLEDFD

Query: 826  ILMQYIKANSKFIGITELKKLESKINKVFSTPIPFSYSKNLDCWVDNEEDIDVIL
             L++YI  N    + I ++ +L+ K+N   ST IPF  SK     +VDN+   +
Sbjct: 817  ALLKYIYDNRGTL-IGQVDRLKDKVNNTLSTDIPFQLSK----YVDNQRLLSTFT

Query: 883  --STXXXXXXXXXXXXXXXXGFNSSVITYPDAQLVPGINGKAIHLVNNESSEVIVH
              +T                 +S I           I+   I L N ESS++ V
Sbjct: 872  IINTSILNLRYESNHLIDLSRYASKINIGSKVNFDPIDKNQIQLFNLESSKIEVI

Query: 941  EYNDMFNNFTVSFWLRVPKVSASHLEQYGTNEYSIISSMKKHSLSIGSGWSVSLK
             YN M+ NF+ SFW+R+PK    S        NEY+II+ M+ +      SGW VSL
Sbjct: 932  VYNSMYENFSTSFWIRIPKYFNSISL---NNEYTIINCMENN-----SGWKVSLN

Query: 1001 WTLKDSAGEVRQITFRDLPDKFNAYLANKWVFITITNDRLSSANLYINGVLMGSA
            WTL+D+     +++ F+       +    N+W+F+TITN+RL+++ +YING L+
Sbjct: 984  WTLQDTQEIKQRVVFKYSQMINISDYINRWIFVTITNNRLNNSKIYINGRLIDQK

Query: 1061 GAIREDNNITLKLDRCNNNNQYVSIDKFRIFCKALNPKEIEKLYTSYLSITFLRD
            G I    NNI  KLD C + ++Y+ I   F +F K LN KEI+ LY +   +   L+D
Sbjct: 1044 GNIHASNNIMFKLDGCRDTHRYIWIKYFNLFDKELNEKEIKDLYDNQSNSGILKD

Query: 1121 LRYDTEYYLIPVASSSKDVQLKN--ITDYMYLTNAPSYTNGKLNIYYR-RLYNGL
            L+YD   YY++ +    +K V + N  I  YMYL   P +      NIY     LY G
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Sbjct: 1104 LQYDKPYYMLNLYDPNKYVDVNNVGIRGYMYL-KGPRGSVMTTNIYLNSSLYRGT

Query: 1178 RYTPNNEIDSFVKSGDFIKLYVSYNNNEHIVGYPKDGNAFN-NLDRILRVGYNAP
              +Y   N+ D+ V++ D + + V   N E    Y    NA    +++IL      P
Sbjct: 1163 KYASGNK-DNIVRNNDRVYINVVVKNKE----YRLATNASQAGVEKILS-ALEIP

Query: 1237 KKMEAVKLRDLK--TYSVQLKLYDDKNASLGLVGTHNGQIGNDPNRDILIASNWY
               ++  +K ++ +  T   ++ L D+    +G +G H  Q  N      L+ASNWY
Sbjct: 1217 SQVVVMKSKNDQGITNKCKMNLQDNNGNDIGFIGFH--QFNNIAK---LVASNWY

Query: 1295 --DKILGCDWYFVPTDEGW 1311
             + LGC W F+P D+GW
Sbjct: 1272 RSSRTLGCSWEFIPVDDGW 1290
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